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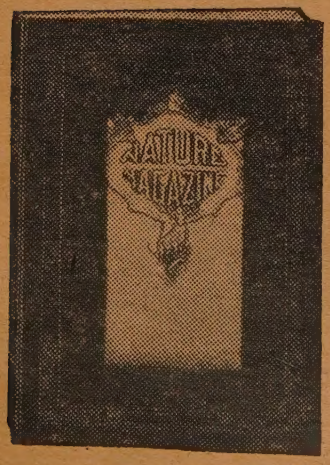

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SWALLOW FROLIC

By EVA SCHNITZER

It was the sunset hour. The west was ablaze with fiery color. Red-gold light streamed from the heavens, and the lake reflected the molten skies. Our little boat lay anchored in a wide cove bordered by blue-purple pickerelweed. Our lines, with their tempting morsels of bait, lay untouched on the calm lake waters. The wind was still. Silently we sat bathed in the radiance transforming land and lake into a golden fairyland.

Suddenly there descended upon us a horde of swift-flying swallows. Thousand upon thousand they came, blotting out the eastern skies, filling the cove with their soft calling. Full half an hour they spent with us, now skimming the lake surface, now swirling high above. Entranced we sat as they frolicked madly in all this sunset glory. And then they were gone, as mysteriously as they had come. Quickly the skies darkened. A chill wind sprang up. The lake waters became ruffled, and little whitecaps slapped at us angrily. Heading landward, we beached our little craft. We looked to the west. The hills were dull, gray-purple, dark. Had we dreamed the swallow frolic?

Ripley Errs

Robert L. Ripley, whose syndicated cartoon, "Believe It or Not," is widely published, has a following that takes his statements as gospel. We all err, but Mr. Ripley's researchers got thoroughly off the track when they allowed the cartoon to say: "The Longest Trail in the World —The Appalachian Trail—2500 miles long. It is made up of Indian Trails and Pioneer Paths extending from Maine to Florida through unspoiled country." *Appalachian Trailway News* points out that the trail is 2050 miles long, is not made up of Indian or pioneer paths and extends from Maine to Georgia, as hundreds of markers along the route proclaim. And if anyone can find 2500 miles of unspoiled country between Maine and Florida he is a magician.

Trout in Titicaca

Lake Titicaca is an inland sea 12,500 feet above sea level in the Andes Mountains of Peru. In it speckled and rainbow trout hatched from eggs imported from the United States are now multiplying, and this year eggs from descendants of fingerlings hatched from North American eggs will be obtained locally. Trout in the lake grow as long as three feet and give a dangerous fight to Indians fishing from reed canoes. Planting of these fishes is part of a Peruvian program to supply the population with larger amounts of animal protein through the development of fresh-water fisheries.

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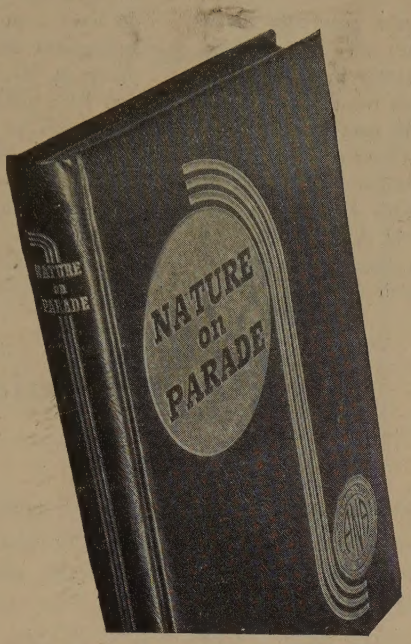

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Nature in Print

By HOWARD ZAHNISER

SHELLEY felt that he was pointing out a great difference between man and lark when he wrote: "We look before and after." The Viking Press has recently published two books that, in an interesting way, show this peculiarly human ability and interest of men to look to the past and contemplate the future. Roy Chapman Andrews, whose autobiography *Under a Lucky Star* was not so long ago discussed on this page, has now written "A Biography of Primitive Man" with the engaging title *Meet Your Ancestors.* Donald A. Wollheim, at about the same time, has been working on one of the volumes for the Viking Portable Library in which creative fiction writers make their very intelligent speculations about even the future seem rather real. *The Portable Novels of Science,* including four complete works selected and introduced by Mr. Wollheim, does not, however—nor does *Meet Your Ancestors*—seem to bear out well Shelley's compounded observation: "and pine for what is not."

Dr. Andrews, at the outset, presses for himself one of the sore spots in his remembrance of laymen's interest in evolution ("just to be sure it is still sore") by recalling the common remark: "No one can make me believe I came from an ape like that!" He often stops, he says, before the gorilla habitat group in the Akeley African Hall of the American Museum of Natural History to listen for this remark, and he declares: "I almost never miss. Someone is sure to say it."

Rather obviously, none of us ever seem to go as far back as prehistoric times in our pining for what is not. Many of us sometimes feel we would willingly transport ourselves into some of the sets of circumstances that have been intermediate between simian days and modern civilization, but we do not want to go too far. It is altogether adequately satisfying to meet these ancestors in the pages and museum displays of our anthropologists.

The novelists of the new hyphenated branch of literature called science-fiction—at least as represented by Mr. Wollheim's foursome—seem also to be expressing an interest that is much more curious than covetous. H. P. Lovecraft, says Mr. Wollheim, "saw the terror of the aeons. To him past and future were dim and shadowy abysses, filled with the nameless horror of the unknown of nature and alien intelligence." Lovecraft's work selected for our reading, *The Shadow Out of Time,* first published in 1936, does indeed seem to bear out our editor's introductory promise that it is "a perfect example of the use of science-fiction to create terror." Learning the universe's secrets, past and to come, according to Mr. Lovecraft's demonstration in fiction, could only lead to the conclusion that (in his own words) "there lies upon this world of man a mocking and incredible shadow out of time."

In a creation of the same past that Dr. Andrews has labored so hard to reconstruct, John Taine leaves the readers of his "gripping" novel, *Before the Dawn,* in a state of mind somewhat similar to that of Dr. Andrews' embarrassed museum visitors. The Williams and Wilkins Company, one of our leading science presses, published Taine's work in 1934, with announcements from which Mr. Wollheim infers it was considered "a technical reconstruction of an actual paleontological period." Readers may indeed feel that they have been so served, yet few of them would be much tempted to make the fictional inventor's "time-scanner" an instrument for frequent excursions beyond the dawn.

Even Olaf Stapledon's *Odd John* and H. G. Wells' *The First Men in the Moon*—the other two novels in this selection—leave a reader feeling somewhat cosy on returning to the living room from the spell of the story-teller, although both do have a purpose related to social improvements which are among our current aspirations, and both do thus disturb complacency. Mr. Wells, with the invention and story-telling skill that have made him famous, uses his highly credible trip to the moon to attain a perspective on human affairs of the present—a perspective from which can be seen a good many possible corrections. It is a question whether Mr. Wells was the more interested in the way he overcame gravity and realized lunar exploration, or in the audience he thus gathered in front of his book for his evangelism, and the question need not be answered. In *The First Men in the Moon,* as in many other works, he reaches both objectives, and, at the same time, arouses interest in science. His works for many years have been both entertaining and significant.

Olaf Stapledon has brought "Superman" into literature, and, in telling the story of a superior human being who finds in the world (through something like telepathy) a few other such beings, has dealt also with the failure of present society to recognize and act wisely toward exceptional individuals—in a world where, as Mr. Wollheim observes, "no infant can possibly grow up without being adversely inhibited in one way or another." Strange as it may seem, however, not many readers are likely with comfort to imagine themselves like odd John, or to anticipate living with him.

Most readers are, in fact, likely to find all these novels more interesting than inspiring.

This may also be true of Dr. Andrews' "biography" of the men who lived so long ago that we have nothing of them but "remains." Dr. Andrews himself has been a leader in exploring for these remains, and some of the most interesting parts of his book are his accounts of how these explorations have been carried on. No matter what a reader may think of the case made for ancestry, he can hardly fail to realize that these explorations are actual human activities of our day. If he is not interested in meeting his ancestors, he may be very much impressed by the phenomenon of scientists searching diligently for evidence of remote ancestors, with ever-encouraged and increasing zeal. "After the war," says Dr. Andrews, "I predict that extensive exploration will enter a new and brilliant era." And again he says: "I can think of no more fascinating or important field for scientific exploration after the war than in Java." And *Meet Your Ancestors* is an excellent source of information about either the conclusions to date regarding the evolution of man, or the studies that have been made in pursuit of the evidence upon which these conclusions are based. Dr. Andrews has been closely associated with authorities in this field of science—not only among his fellow explorers but also among the laboratory scientists—and in *Meet Your Ancestors* he has, as he says, "drawn extensively upon the literature of human evolution." The result, as he has fashioned it, is an easily read, general introduction to a subject that has been one of the most interesting recent developments of our time.

There can, of course, be only one practical purpose in reading about the past and the future, and that is an improvement of the present. Whether such an improvement is merely a more endurable killing of time through the pastime of read-

Keats' Nightingale

By W. F. JENKINS

Your little trilling throat, each tiny bone
Long, long have lain in the indistinguishable mould
You were the darkling voice to wake, intone
The one incessant message night has told
Through the long reach of time. But you alone,
The singer, sensed the song—until laid hold
For capture by a gloried microphone
That sounded clear its meanings manifold.

ing, or, more seriously, a search for a better understanding of how to act, will depend on the reader. *Meet Your Ancestors* and *The Portable Novels of Science* can serve either purpose. From the anthropologists there seems to come a better comprehension of why we act as we do, or why we wish to act as we usually do not. From the novelists who feed their imaginations on scientific data there seems to come a keener apprehension of our aspirations—not as friends, lovers, parents, holders of occupations—but as creatures in a still unexplored universe. From both there most certainly comes a great deal of evidence that in all Nature the greatest perplexity—to man at least—is the nature of man himself.

Meet Your Ancestors: A Biography of Primitive Man. By Roy Chapman Andrews. New York: The Viking Press. 1945. 257 pp., with endpaper drawings and 20 text drawings by Thomas Voter, bibliography, and index. $3.

The Portable Novels of Science. Selected and with introductions by Donald Wollheim. "The First Men in the Moon," by H. G. Wells; "Before the Dawn," by John Taine; "The Shadow Out of Time," by H. P. Lovecraft; "Odd John," by Olaf Stapledon. New York: The Viking Press. 1945. 737 pp. $2.

Spice

The Spice Handbook. By J. W. Parry. Brooklyn, N. Y. Chemical Publishing Company. 1945. 254 pages. Illustrated. $6.50.

The author of this book writes against many years of experience in the milling and sale of spices, and has produced a volume that serves as a guide for the manufacturer, importer and salesman who desires a greater knowledge of the properties of barks, rhizomes, fruits, seeds and herbs in which they deal. The book is also of interest to the botanist, particularly the economic botanist.

He Prefers Paulina

Paulina Preferred. By James G. Linck. Portland 9, Oregon. 1945. Binfords and Mort. 220 pages. Illustrated. $3.00.

Paulina, in this book at least, is not a girl. It is a lake in the Cascade Mountains in southern Oregon. The author was born in Pennsylvania, fished as a boy in the Adirondacks, has traveled widely, and makes his home in Nevada. But he prefers Paulina, the lake, the peak of the same name, and that part of the Cascades that has taken the name of the Paulina Country. Mr. Linck loves the outdoors and the creatures that people it, and he writes about both, simply and from the heart. Apparently accomplished at handling rod and reel, he is equally so with lens and filter, for his book is illuminated with many fine pictures, including a series of the cony. Some of these pictures, and the story of how they were obtained, were published originally in the pages of *Nature Magazine.* This book is one that will be enjoyed by any lover of the outdoors, particularly by fishermen. And his publishers have given Mr. Linck a most attractive and tasteful volume. R. W. W.

From Midway

Midway Photos and Verse (. . . or Worse). By Lewis Walker and Loring Hudson. San Diego 1, California. 1945. Hester Colorographic Studios. Illustrated. $2.50.

Lewis Wayne Walker, who is certainly no stranger to the readers of *Nature Magazine,* provided the fine illustrations for this entertaining book, as well as cartoon drawings that accompany the verse by his collaborator, Loring Hudson. Mr. Walker, in civilian life on the staff of the San Diego Museum of Natural History, was Sergeant of Marines in charge of teaching survival lore. Mr. Hudson was a civilian specialist in the same field, doing his teaching at the Bishop Museum in Honolulu, where he also taught English. The idea of the book was born when many of Sgt. Walker's fellow Marines clamored for copies of the splendid pictures he had taken of the bird life of Midway and other mid-Pacific islands. These fighting men had found the birds fascinating and wanted to know all about them. This book provides the information amusingly and sketchily in verse form, and in connection with the illustrations. It is a lot of fun and will appeal to all servicemen who have been in the islands, and to their families and friends. R. W. W.

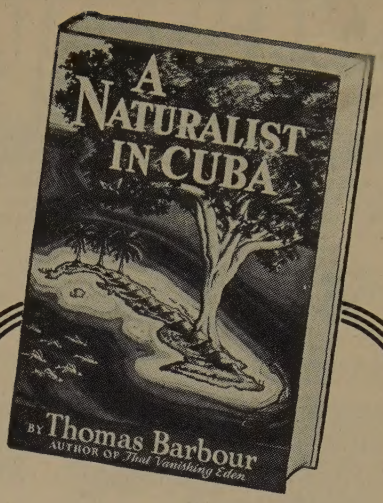
Mexican Snakes

An Annotated Checklist and Key to the Snakes of Mexico. By Hobart M. Smith and Edward H. Taylor. Washington, D. C. 1945. Smithsonian Institution. 239 pages. Fifty cents.

The title is descriptive of this checklist, which is published as Bulletin 187 of the United States National Museum. It is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Raccy Back in Zoo

Readers who made the acquaintance of "Raccy," the raccoon about which A. B. Champlain wrote in the October issue of *Nature Magazine,* will be happy to know that she is spending her fourth winter in the safety of the Harrisburg Zoo. As in previous years, she was trapped as the gunning season was about to open, lest her friendliness with mankind prove her undoing at the hands of some hunter. After her winter sojourn she will again be returned to the wild in the vicinity of Dr. Champlain's Rattlesnake Shack.



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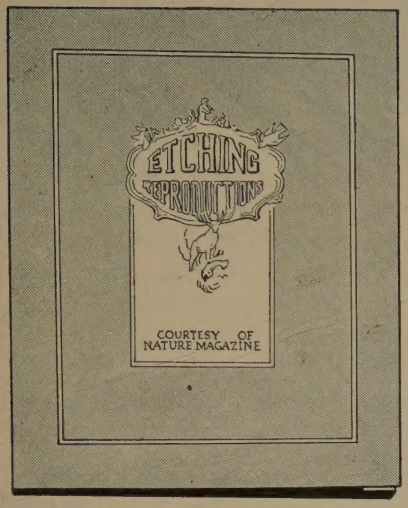

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For Mathematicians

Table of Arc Sin X. New York. Columbia University Press. 1945. 124 pages. $3.50.

Tables of Associated Legendre Functions. New York. Columbia University Press. 1945. 306 pages. $5.00.

These two volumes were prepared by the Mathematical Tables Project conducted under the sponsorship of the National Bureau of Standards. They were started in 1938 under the auspices of the Works Progress Administration for the City of New York and were completed with the support of the Office of Scientific Research and Development. Dr. Lyman J. Briggs, Director of the Bureau of Standards, was the official sponsor, and Arnold N. Lowan was the director of the project. Unquestionably these are publications important to the mathematical world, but their exact significance is lost, we confess, upon our definitely unmathematical mind. There are many frightening equations that make us bow in awe to the mathematician who can understand them, and pages and pages of tables, which, we presume, make computations in higher mathematical fields much simpler. We are happy to announce these two books here, although we are not competent to evaluate them. R. W. W.

Thailand Birds

The Birds of Northern Thailand. By H. G. Deignan. Washington, D. C. 1945. The Smithsonian Institution. 616 pages. Illustrated. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $1.25.

This account of the birds of the northern provinces of Thailand, or Siam, is based upon material gathered during ornithological explorations of this region beginning with the studies of Sir Robert Hermann Schomburgk in 1859, and culminating with the author's own studies from 1928 to 1932, and between 1935 and 1937. Although prepared primarily for the use of bird students, the author's descriptions of the birds and their habits are popular and interesting reading. One could wish for pictures of many of the fascinating birds described, but perhaps these will come some day.

British Countryside

National Parks and the Countryside. By Sir Norman Birkett. New York. 1945. The Macmillan Company. 36 pages. $.60.

This little booklet preserves between covers the text of The Rede Lecture for 1945 delivered at Cambridge University by Sir Norman Birkett, who is chairman of the Standing Committee on National Parks and President of the Friends of the Lake District. It is of particular interest to lovers of National Parks and wilderness areas in the United States.

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Thanks—and Happy Holidays
BELL TELEPHONE SYSTEM

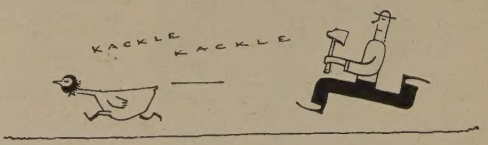
Contents Noted

WHEN Alfred Nobel perfected dynamite he was afraid of what he had done. Dying, he left most of his fortune to further the cause of peace; to prevent, if possible, the use of his discovery for the destruction of mankind. The humility of Nobel becomes us today. By the release of nuclear energy we have, says H. D. Smyth, "a new tool for mankind, a tool of unimaginable destructive power." We have discovered a new insecticide of immense lethal strength. Scientists tried one thousand and seventy-nine times, and then, with one more try, produced "1080," a rodenticide that is one of the most poisonous of known substances. Man has forged far ahead of Nature—with all her powers of wind and earthquake and lightning from the heavens—as the greatest destroyer. And now he has started to play with the means for the suicide of civilization. Unless he can match invention with wisdom, he will erase himself.

THERE was a time we could flip a bandage support around a theoretically sprained ankle, tie a square knot with our eyes closed, unerringly find all the pressure points, and give hypothetical artificial respiration with minimum discomfort to the victim. We even became rather adept at traction splints, although we were vastly relieved that no bombs fell and we had no occasion to put this ability into practice. All this, of course, came in our air raid warden days, when our Red Cross First Aid card was fresh and new. And we would not bring the matter up now except that we must, as a loyal first-aider, record receipt of a copy of a new and revised edition of that best seller, *American Red Cross First Aid Textbook*. There has been a complete rewriting in the light of new knowledge resulting from the war. There are new illustrations, better ones, we think, than those in the edition we used. It struck us that a brush-up course is in order for a lot of us.

AS WE pass into a new year, the twenty-third in the life of this magazine, we feel a certain unrest, a lack of complete confidence in man's ability to solve the ever-more-complicated problems of his future. Perhaps this is a reaction from restriction and regulation of war years, during which everything was focused on the one goal of victory. Now the focus is a little fuzzy, what with labor-management strife at home; with armed strife in Java and China, the Balkans and the Holy Land; with erstwhile comrade nations doubtful of one another; with the seemingly insurmountable task of reconstruction of nations physically, and millions of people morally and socially. Somehow, probably because we are older, we do not feel the elation of hope for a better and friendlier world that we felt after World War I. The cataclysm of World War II has, of course, been far greater; has set civilization farther back, we think, than any previous conflict, however much it may have contributed in invention, which is often mistaken for progress. There is much to be said for the simpler, quieter years of nostalgic memory. There is much, also, to be said for association with Nature as an antidote to our doubts. If our labor leaders and our industrial magnates, our economic and social theorists and our practical politicians, even our physicists and our fascists, could spend a month camping in the wilderness, close to the delicate balances of Nature, they might emerge wiser and more capable of meeting the future and the problems that it presents.

POULTRY byproducts are going to waste to a greater degree than necessary says the U. S. Department of Agriculture. About one hundred million pounds of feathers are picked from chickens annually in poultry dressing plants, but only a quarter of them are used. Yet feathers are fiber, similar chemically to sheep's wool and hogs' bristles. A feather thread can be made to be woven into cloth or twisted into yarn, and it can be used for surgery, since it is eventually absorbed. Ground up feathers can be made into wallboard of high insulating value, and, when mixed with rubber byproducts, they make a sort of artificial leather. The French like pickled cock's comb, and the chicken's shanks and feet make excellent gelatin. The chicken's oil sack has possibilities, and its visceral fat has proved value in soap making. As yet no use has been found for the cackle.



THE Eleventh North American Wildlife Conference will be held in New York March 11 to 13. Its theme will be "The Place of Wildlife in a Changing World." After no conference last year, due to transportation difficulties, and somewhat restricted meetings during the war years, this gathering will be a vitally important conference for all interested in conservation of game animal life and other natural resources.

R. W. W.

Weathermen in uniform worked on all of the fighting fronts, from the jungle islands of the Pacific to Greenland and Iceland. Here weather technicians install a new wind vane for the base weather station on the island of Saipan.

Returning to base after a raid, these B-24s land in a snow storm. The Army Air Forces weathermen try to anticipate such conditions, and some of them traveled ahead of bombing missions in special weather reconnaissance planes to report on the situation.

The "Mets" and Mars

The story of the weatherman and his part in victory

By EDNA H. EVANS

Photographs from the U. S. A.A.F.

IF, AT some future veterans' convention, the uniformed weathermen of World War II get to swapping experiences, their tales easily can hold their own with hair-raisers from any other branch of the service. They can jingle plenty of medals, and, as for variety—few other outfits will be able to match the meteorologists.

The "mets" went along with Mars all over the globe. They traveled by snow tractor and dog team to Greenland's frigid ice cap, and they carried their own equipment through torrid jungles of the South Pacific. They parachuted into the Balkans ahead of the campaigns in Sicily and Italy. They jumped with the airborne spearheads on D-day in Normandy. They flew in one-man fighters ahead of regular bombing formations, and they rode in B-29s over Tokyo.

Weather is a vitally important factor in modern warfare. For that matter, weather has been important ever since the first cave man discovered it was better to stalk his prey from a downwind position. But accurate weather forecasting for military purposes is a recent thing. Alexander and Caesar depended on prayers and libations to bring favorable weather for their campaigns. Weather forecasts in those days were still in the chief magician's department. A thousand years later bad weather probably killed as many Crusaders as did the scimitars of the Moslems, although history often ignores weather.

Spain's proud armada came to grief in 1588 when a storm struck it in the English Channel. Napoleon disregarded the severity of Russian winters and left most of his army frozen on the road to and from Moscow. Later a rainstorm hampered his artillery and lost him the Battle of Waterloo.

Indeed, weather was most unkind to Napoleon, and it is not a little ironic that an important American weather station was established at St. Helena, the tiny South Atlantic island where the French Emperor spent the last six years of his life. The station was small, but its reports helped formulate the forecasts for the busy Air Transport Command routes between South America and Africa.

Both sides in the recent war employed weather as a weapon. The Germans took advantage of the unusually good dry weather that prevailed in Europe during the summer of 1939, when they rolled westward through France, Belgium and Holland.

In 1943 they sent their great ships, *Gneisenau* and *Scharnhorst*, slipping from the port of Brest through the English Channel to more secure hiding places while squally, foggy conditions, and an exceptionally low icing level for aircraft held the British navy and the RAF helpless to stop them.

Later still, the Germans launched their Belgian Bulge counterattack and breakthrough at a time when fog, haze and low-hanging clouds kept the

Theodolite operator at a weather station in Greenland takes his readings. Men stationed at these far outposts suffered many hardships and some lost their lives in this inhospitable country.

Allied airmen on the ground. Commanders fumed, pilots chewed their nails, and weathermen scanned their instruments anxiously. Meanwhile, the German panzer units, set in motion because of weather information from their own lines, rolled onward. Not until American weather officers spied a high pressure area moving in were the airmen told to get ready.

While meteorologists on the ground saw the break coming, weather reconnaissance pilots found openings in the clouds so the large bombers could have a clear view of their targets. Then bombers and fighters roared out to blast supply and communications lines, and the powerful German advance distintegrated into chaos.

Half a world away, on the morning of December 7, 1941, the Japanese carriers steamed close to Pearl Harbor and the Philippines behind a curtain of rain and clouds that masked their movements until the last possible minute.

Several times after Pearl Harbor Jap naval forces attempted to hide their advance under clouds and storm fronts. But their earlier luck did not hold. Twice the clouds lifted, leaving the Nipponese navy exposed—an excellent target for American fighters and bombers.

On the Allied side, it was three weathermen who had the final word with General Eisenhower before he gave the go-ahead signal for the Normandy invasion. In fact, it was on the advice of meteorologists that the invasion was postponed twenty-four hours after its original schedule because of a storm front moving eastward across the Channel.

In connection with earlier North African and Italian campaigns, weathermen helped plan the bombing missions that destroyed oil refineries and other military installations within range of the bases wrested from the Germans in that area. Everywhere, on all battle fronts and at isolated stations far away from the fighting zones, weathermen kept the Allied forces marching, flying, sailing and shooting on the road to victory.

To begin at the beginning, the outbreak of the war found the United States with only a handful of trained meteorologists. Many of these were serving in the U. S. Weather Bureau. Others were just completing courses at colleges. But many future weathermen scarcely knew a thermometer from a barometer—and never expected to.

Even so, the Weather Service was in the war from the very first. Five weathermen were killed during the Japanese attack on Pearl Harbor, and fifteen others were either killed or captured on Bataan or Corregidor.

Up until four years before Pearl Harbor the few meteorologists in the army were a part of the Signal Corps. Then, in 1937, the Weather Service, consisting of a small group of officers and men, was transferred to the Air Forces. By the time the war ended, that small group of "mets" had multiplied its numbers by 10,000 percent. Its motto, *Coelum ad proelium elige*, meaning "choose the weather for action," had been put into practice countless times. Generals with stars on their shoulders looked to weathermen wearing eagles, leaves, bars and even chevrons, for the final go-ahead signal for action.

Ultimately set up as the first worldwide outfit of its kind in history, the AAF Weather Service maintained dual headquarters. Broad policies of the Service were shaped at the Weather Division in Washington, D. C. The division also prepared long-range forecasts and climate data used by the air, ground and service forces.

Nerve center and administrative clearinghouse of the Service was at headquarters in Asheville, N. C. Headquarters had the job of sending trained and fully equipped personnel overseas, and also exercised control command over weather squadrons and regions

Men of a weather detachment on a captured and shattered South Pacific island prepare to make a balloon run to check on weather conditions. Such groups landed with all of our attacking forces.

in continental United States, and in most of the Western Hemisphere.

While the Weather Service is connected with the Air Forces—for obvious reasons since airplanes are exposed to many varieties of weather in a short period of time—the meteorological information was made available and was used extensively by other branches of the service as well.

Field and anti-aircraft artillery batteries received four complete ballistic messages daily from the Weather Service. The gunners found these helped to improve accuracy, especially in their long-range, high-altitude fire. Weather reports also helped the artillery in its sound-range techniques for locating enemy batteries. Close air support for the ground operations also was made possible by the weathermen serving with advanced units of the army combat troops.

If an amphibious operation was being planned, weathermen of the Oceanographic Service were called upon for the best possible data on sea, surf and swell conditions. If a land operation was to be made, meteorologists were asked to forecast soil trafficability for unpaved roads and open ground that would be used by armored and motorized columns. This latter was one of the most difficult jobs weathermen had to do. Proper performance of such an assignment required a detailed study of rainfall and evaporation and their effects on various kinds of soils over a six-month period. To supply this information, weathermen did not wait until just before the operation. Instead, they drew detailed soil maps of future battle areas, and supplemented these with all available data and spot observations made when the time came.

The Army Engineers turned to the weathermen when they had to bridge the swollen Volturno River in Italy. They wanted rainfall forecasts for reference in designing bridges and timing their construction.

Before the Army poured across the Rhine in the final victorious drive toward Berlin, American weathermen had set up a bureau, similar to those used on the Missouri and Mississippi, for gauging flood stages of the German river.

In India the Weather Service provided monthly records of maximum and minimum temperature, humidity, rainfall, and direction and velocity of winds, for use of the Malaria Control Service. In England other meteorologists put together climatic data for certain sections of the British Isles at the request of the Medical Corps.

In this hemisphere, engineers used both climatic information and periodic forecasts in building the Alcan Highway and other installations in Canada and Alaska. The Quartermaster Corps also used maximum and minimum temperature forecasts in planning the handling, transportation and warehousing of large stores of perishable foods and other Army supplies.

Other flying weathermen rode patrol on Atlantic and Caribbean hurricanes. They plunged into the hearts of those great circular storms to see for themselves what went on. While the planes pitched and tossed and the pilots battled to keep the wings level, the meteorologists sampled air and wind velocity, took barometer readings and added much to man's knowledge of the inner workings of hurricanes.

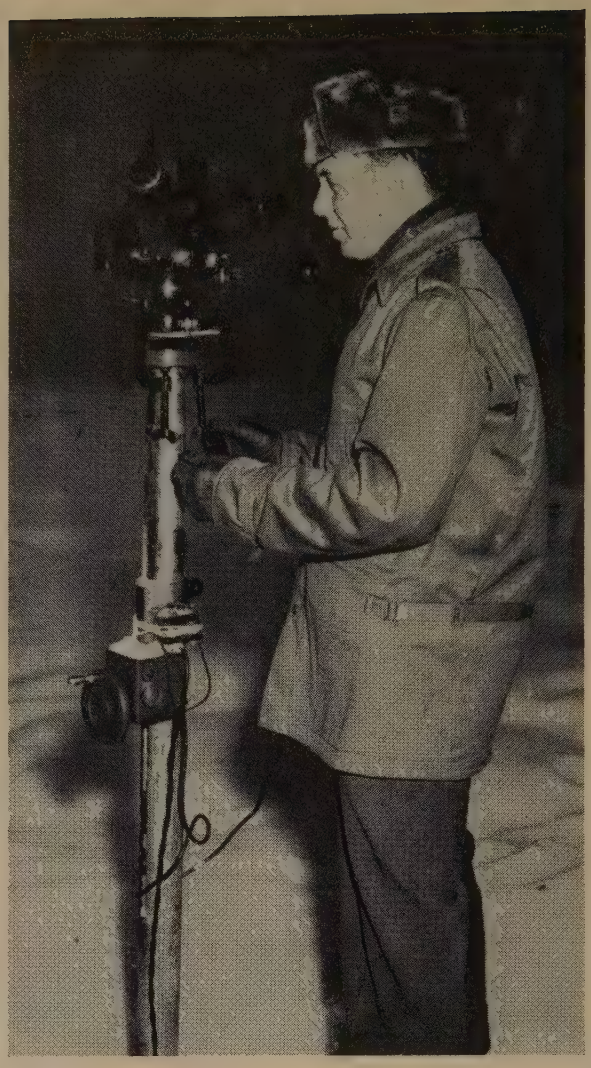
Naturally, because of the important role it played in making their missions successful and bringing their craft home safely, the Air Forces used the AAF Weather Service to the greatest extent. The pilot's route is a vastly different one from that of the railroad engineer, the bus driver or the private motorist. On the ground the main barriers remain the same—a mountain stays put, and so does a river, except at rare flood-time intervals.

But the pilot may find that yesterday's favorable route is today filled with jagged, cloud mountain peaks, vast rivers of moving air, or areas that shoot

up and down as suddenly and much more unexpectedly than elevators. Bright, clear weather at the take-off point can change dangerously to thick fog, rain and general bad weather at the place of destination.

Pilots, flying the northern Atlantic route from the United States by way of Newfoundland to Scotland, were briefed by a weather officer before their take-off. Referring to a large weather map and to profile charts, the meteorologist told the fliers at what altitude they should fly to get under clouds, and advised when the planes should climb in order to fly over them. Thus armed, the pilots knew when to expect clouds and turbulence, and where to avoid the flying condition of icing.

The same type of weather study was made for the middle Atlantic route from the British Isles by way of the Azores and Bermuda to the United States. The northern route was used mostly for eastbound traffic, for tailwinds there helped the planes along. Conversely, the westbound trade winds boosted the planes along over the middle route.



Operating a theodolite in a snowstorm in Greenland. Small hydrogen balloons are released and viewed through this instrument to determine the direction and velocity of the wind. Many balloons were found and returned by Eskimos.

Riding the winds was put to good advantage in the Pacific theater also. By accurately forecasting wind velocities at various levels, a weather officer saved one gas-free trip out of each eleven missions over Burma during the monsoon season. Because the pilots knew at what heights to fly to get the maximum advantage of tailwinds, and at what heights to find minimum interference from headwinds, each trip took from fifty to sixty gallons of gasoline less.

The weathermen in World War II did not wait for the weather to reach them. They went out in search of it. Especially trained P-38 pilots flew ahead of many bombing missions, testing the weather for the big bombers. These flying weathermen were their own pilots, gunners and observers. Their planes retained the fighting armor, but three of the five guns were removed to make room for extra equipment. Still, the two remaining guns were workable, and the pilots frequently used them.

Often flying by instruments alone, in the teeth of wind, ice and cloud, the reconnaissance men found holes for the bombers, or else radioed back information that kept the big planes grounded. Sometimes, when one target could not be reached, an alternate target was arranged. The P-38s, usually sent out in pairs for their own protection, ranged two hundred miles or more ahead of the bombers. Sometimes a second pair was sent out to relay radio messages from the leaders to the controls at bomber bases.

This procedure generally reduced the number of false starts and futile missions, and also cut down the hazards to be met by the bombers. Enemy interceptors and ack-ack fire were bad enough, without having to buck the weather, too.

Weather plays pranks and does unpredictable things sometimes, but its behavior usually falls into a fairly consistent pattern. The high and low pressure areas and the storm fronts move in a general west to east procession in the northern hemisphere.

This fact was an advantage to the Allies in Europe because the British Isles knew what the weather was to be before Fortress Europa did. It was an Allied disadvantage in the Pacific, for there Japan got the weather first.

To make even fuller use of the west-to-east weather movement, both sides tried to establish weather stations in Greenland. Such stations were bombed and bombarded until finally the Americans took firm control, as protectors, in both Greenland and Iceland.

Weathermen in the far northern latitudes battled cold, hardship and homesickness on assignments that cut them off from the rest of the world for months at a time. They fell into glacial crevasses and were lost. They were frozen to death, were drowned in icy waters, and one was engulfed by a river of molten lava that burst from Mt. Washington on Chuginidak Island in the Aleutians.

At far northern weather stations the instruments were mounted on stilts to keep them from being buried in the snow. Camps actually were covered with snowdrifts, and the men got (Continued on page 53)

Whirligig beetle and a strange fish called *Anableps*, which has eyes divided somewhat like those of the beetle. The fish can see its insect food both above and below the surface of the water.

Some Marvels of Animals' Eyes

By JOHN Y. BEATY

Illustrated by Wilfrid S. Bronson

Some animals have eyes that enable them to see around corners; some have eyes on the ends of each of five arms; some have eyes on two tall stalks projecting above the body. There are some animals with two eyes that can look neither forward nor backward, because one looks to one side and one to the other. Some fishes see forward and backward at the same time; some insects can look up and down at the same time. But there are fishes that can look only upward; some that have eyes that migrate; some deep sea fishes that must furnish the light for their eyes.

There are some worms that have eyes all over the body; some animals that have no eyes at all; others to which the whole body serves as one big eye. The birds are provided with eyes with sun-glass lenses—the nictitating membrane—and in some mammals these membranes form effective shields from wind and dust.

Many snails, including some commonly found in our gardens, have eyes at the end of tentacles, which are extended or withdrawn much as a telescope is lengthened or shortened. With these, a snail can look around a corner without exposing its body. If the snail senses danger, the eyes are instantly withdrawn, and the animal retreats into its protective shell.

Similar eyes that can be used as periscopes are possessed by the larvae of the spiny lobster, which is a favorite food of certain fishes. Its eyes are on long tentacles, enabling it to hide under a rock or shell and risk only one eye until it learns whether or not a hungry fish is nearby seeking a young lobster dinner.

The eyes of the lobster and the crayfish are also on stalks, but these stalks are not so long. This mounting serves mainly to allow the eyes to be pointed in different directions.

The eyes of daddy-long-legs, supposed by many people to be a true spider, are on stalks that project above the body. Its proper popular name is harvestman, and its eight legs show that it is a close relative of the spider, although it cannot produce silk for webs.

While most animals, other than insects, have eyes designed to look in one direction only, there are some animals that have eyes that look in opposite directions. Whales, for example, have their eyes located far back on the sides of their heads, so that one eye looks to one side and one to the other. Neither eye can possibly see what the other one sees; neither eye can look forward nor backward because it cannot be moved. For this reason old whalers approached the huge animals from directly ahead or astern. If a whale wishes to survey the entire horizon, it stands up in the water and slowly revolves its body.

The seahorse, however, that strange little fish with a head like a tiny horse, apparently can see both forward and backward at the same time. The whirligig beetle, which we see on the surface of quiet water, is equipped to look up and down at the same time. Its eyes are divided so that the upper part sees the surface of the water and the lower part sees below the surface. There is a black layer of pigment between the two parts so that light from one does not affect the other.

Bee and flycatcher. Ability speedily to change the focus of their eyes enables some birds to catch insects on the wing with amazing dexterity.

There is a strange fish, *Anableps*, commonly called the four-eyed fish, that has its eyes divided somewhat like those of the beetle. It can search for insects on the surface, and, at the same time, with the lower part of its eye see what is beneath it in the water.

Fishes that live on the bottom of the ocean, and some that live in the lower levels of water above the bottom, have no reason to look anywhere but upward. Their food comes down to them, and their eyes are designed to look up. Those fishes known as flat fishes are born with eyes in what we would consider a normal position, but, as they grow older, the eyes slowly migrate until they are both on one side. The fish then swims with this side as the top of its body.

Flat worms of at least one family have eyes all over the body. These eyes apparently do not discern objects, but they enable the worm to respond to light. In fact, most worms have light-sensitive bodies, even though they have no distinct eyes. In effect, the whole body is one big eye.

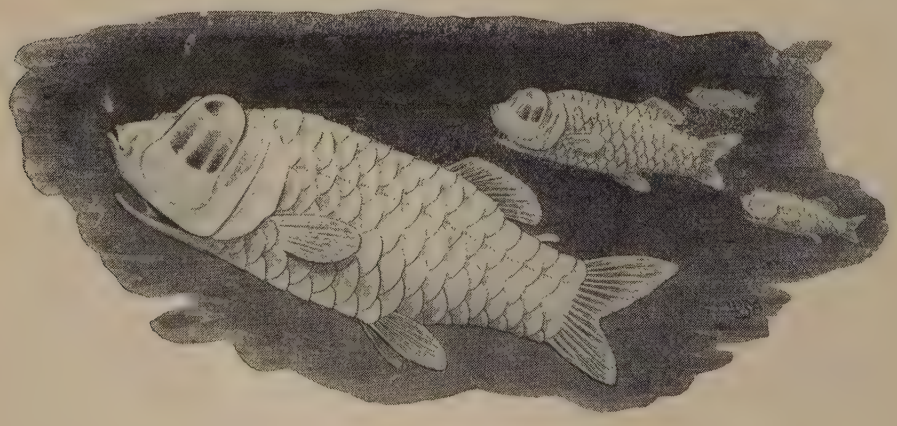
In order for an eye to operate, light must be reflected from some object back into the eye. In the sea depths, where the sunlight cannot penetrate, there is no natural light, so deep-sea fish must provide their own light if they are to see. Some carry quantities of bacteria, or tiny little luminous plants, which furnish the light. Some carry other luminous animals, such as sea anemones. Some have their own headlights.

The larvae of the spiny lobster, which is a favorite food for certain fishes, has its eyes on long tentacles. These can be used as a periscope, and the animal can hide and risk one eye watching for a hungry fish.

There are some animals that one would expect to have eyes, but which do not see at all. There is the blind fish found in the waters of Mammoth Cave, the hag fish or slime eel, of many oceans. These blind animals find their food and mates through other senses.

Ants are also sightless creatures, although they do have eyes that distinguish between light and dark. However, they find their food and mates by a sense of smell located in their antennae. Another sightless creature is the tapeworm, dwelling inside the human body, where it does not need sight.

There are many sea creatures, such as oysters, that have no true eyes, but that are so sensitive to light that a shadow passing over them, or approaching, will lead



Fishes that live on the bottom of the ocean or in the lower strata of water often have eyes that look upward, since they have no reason to look in any other direction.

them to seek safety by withdrawal into their shells.

Long before man had the idea of protecting his eyes with wind glasses or a wind shield, the camel was using his own wind shield on his eye to keep out the sand. This desert animal is equipped with a sort of third eyelid, which may be drawn down at will over the eyeball without impairing the sight.

Birds have this third eyelid, also, enabling them to fly into the wind. And birds have other marvelous characteristics in their eyes unequalled by other creatures. A hawk or vulture, for example, may spot a small animal on the ground far below. It goes into a dive, but in order to get unerringly to its prey it must keep it in clear vision during the descent. If we humans were to move as rapidly toward something five hundred feet away, the iris in our eyes would have to change a great deal for us to keep the object in clear vision the entire way. This is what the iris of the hawk does, but it does it so rapidly that it is difficult to understand how it can keep in focus on a tiny rodent in the few seconds of a rapid dive. This speedy change of focus enables birds to catch insects on the wing with amazing dexterity. Some birds' eyes also are equipped with a sort of sunglass lens, which enables them to look directly into the sun without injury to the eye or impairment of vision.

The eye is a remarkable mechanism in any case, the human eye being able to accomplish amazing things and sustain great punishment without or with the aid of the optician. And elsewhere in Nature the eyes of many creatures have been marvelously adapted to a wide variety of specialized needs.

Genesis

By CHARLES EDGAR GILLIAM

The snows come from the skies,
Flake by flake,
And of drab stiles and styes
White beauties make.

The greatest works of art
And love are made
With tireless hand and heart—
Shade by shade!

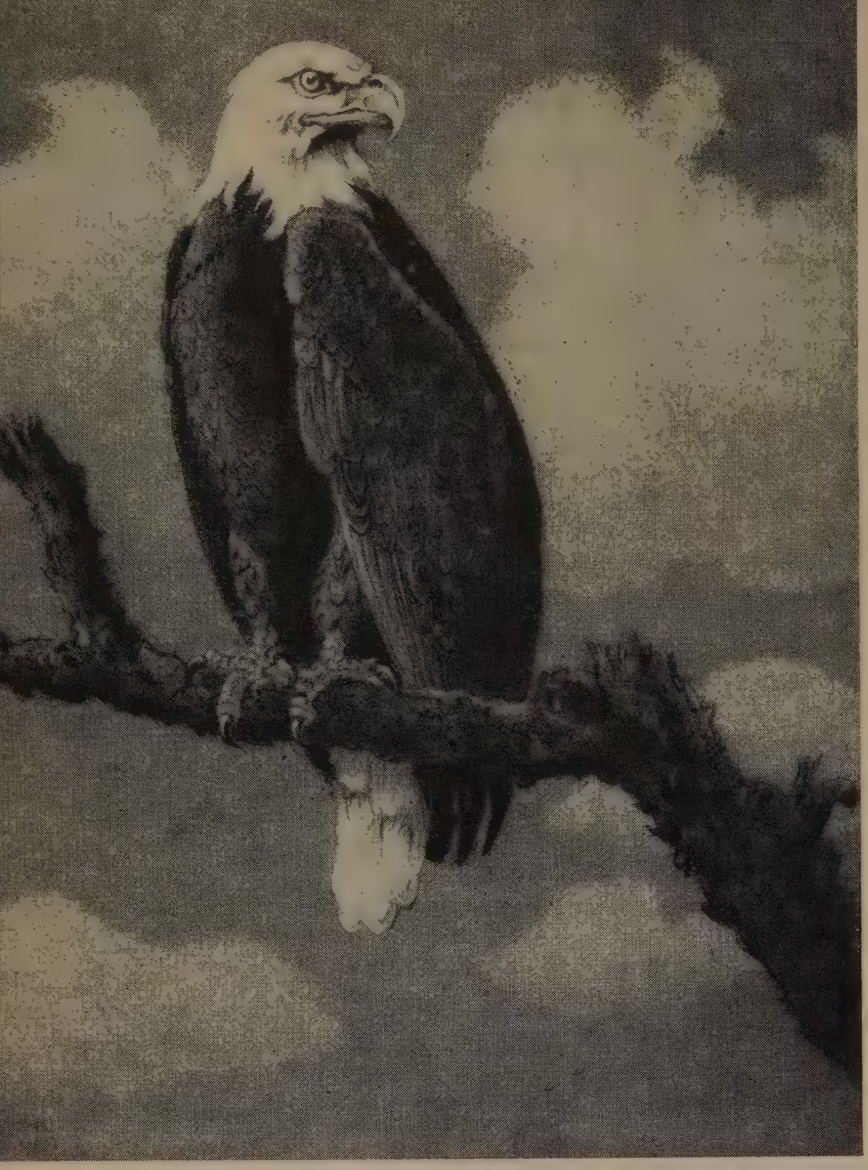
An Insect Surprise

By GEORGE A. SMITH

A SURPRISE was in store for me when I was about to photograph the emergence of a swallow-tail butterfly from its chrysalis. In the fall of the year I had collected several swallow-tail chrysalises, attached to weed stems in papoose-like fashion, and taken them inside for the winter. They were kept in a conspicuous place on a reading table for close observation.

One morning in early spring I noticed a little round hole was being chewed through the side of one of the chrysalises. Something unusual was about to happen! Instead of a butterfly emerging, a red-legged ichneumon fly proudly crawled out through the newly-chewed hole in the side of the chrysalis. A color photograph would have shown the insect's beautiful blue wings and orange-colored body. An ichneumon fly had stolen the show from the rightful owner of the chrysalis.

This species of ichneumon fly has the habit of laying its eggs under the skin of butterfly caterpillars so that its grubs, when they hatch out, will have juicy food close at hand. Usually a caterpillar is so weakened from the effect that it is unable to reach maturity. Occasionally a caterpillar manages to change into its chrysalis even though it contains the egg of an ichneumon fly. In such a case, the grub, upon hatching, feeds upon the butterfly pupa inside the case. When the ichneumon fly is ready to emerge, it frees itself from the butterfly chrysalis by chewing a hole through the side of the case, this "escape hatch" showing clearly in the picture herewith.



The American Eagle. Reproduced from an original etching by Benson B. Moore.

★

Uncle Sam's Bird

By DONALD CULROSS PEATTIE

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THE United States of America has a king. He shows himself in every state in the Union and in the territory of Alaska, and is seldom seen outside this country except in the dominion of our friendly neighbor, Canada. He is king of the air, undisputed ruler of the sky, the American or white-headed eagle.

As a proud monarch should have, he has regal features—a snowy head, an aquiline nose, a piercing eye. In fact, he bears a distinct resemblance to Uncle Sam himself. The eagle was officially placed on the Great Seal of the United States by act of Congress on June 20, 1782, while Uncle Sam, as an impersonation with familiar features, began to show his face in newspaper cartoons more than 30 years later. So it is true in this case that people grow to look like their pets!

Congress chose well when it picked this species for the national emblem, rejecting the golden eagle, which was originally proposed by the designer of the seal. This darker bird, although also found in the United States—rarely west of the Rockies—for centuries has been a heraldic symbol in such undemocratic states as Czarist Russia, the Austrian Empire, Napoleonic France, the Prussian Empire, the Roman Empire, and, indeed, of tyrannies and dictatorships running back to Assyria.

Handsome it may be; as a harrier of young stock the golden eagle has a thousand marks against it for every one that can be charged to the American eagle, whose favorite diet is fish. Honest old Ben Franklin, who wanted to make the strutting and stupid turkey gobbler our national bird, charged the American eagle with being a coward, a bully and a verminous thief. He did not know, apparently, that this bird of our choice is more attached to its home, is more faithful to its mate, and spends more care in the education of its young than almost any other in our skies.

Eagles mate for life. This is claimed for many birds, but usually falsely. The eagle pair do stick to each other, in breeding season and out, until death does them part. Only then will the bereaved one disappear from its accustomed haunts to roam the skies—now so often empty of eagles—till somewhere it finds a new mate and leads it home. Courtship begins earlier in the year (or later, if you prefer to call November that) than that of any other of our birds. And it lasts longer, continuing until June. In their eyrie, usually at the top of a very tall tree not far from water, the couple live in fierce and ardent devo-

tion. There seems reason to think that the mating act is repeated, at dawn and sunset every day, until the eggs are laid and even after—as if the union were not for reproduction only. One ornithologist tells of the wild cry that rings out from the mating birds, over the tops of the trees steeped in shadow and awed silence.

No other bird is so deeply attached to his home. The eagle never leaves his bailiwick, except to seek a mate, or when forced to migrate from failure of food supply. Most birds desert the nest at the end of one season; it is to them not a home but a cradle. But the eagle each year builds a new nest on top of the old one. And an eagle may live as long as an average man—perhaps longer. So the nest grows and grows in grandeur, and serves not only as a cradle but as a permanent home for the parents, summer and winter. One nest in a tree that blew down near Lake Erie was found to weigh nearly two tons, and represented several decades of occupancy. Another, found on a rock off the California coast, contained several wagon-loads of sticks and leaves. Coarse branches sometimes six feet long formed the breastworks of this bird castle. Within, it was lined with soft grasses, lichens, moss and feathers. And the view from such a wilderness mansion is usually the grandest in the countryside.

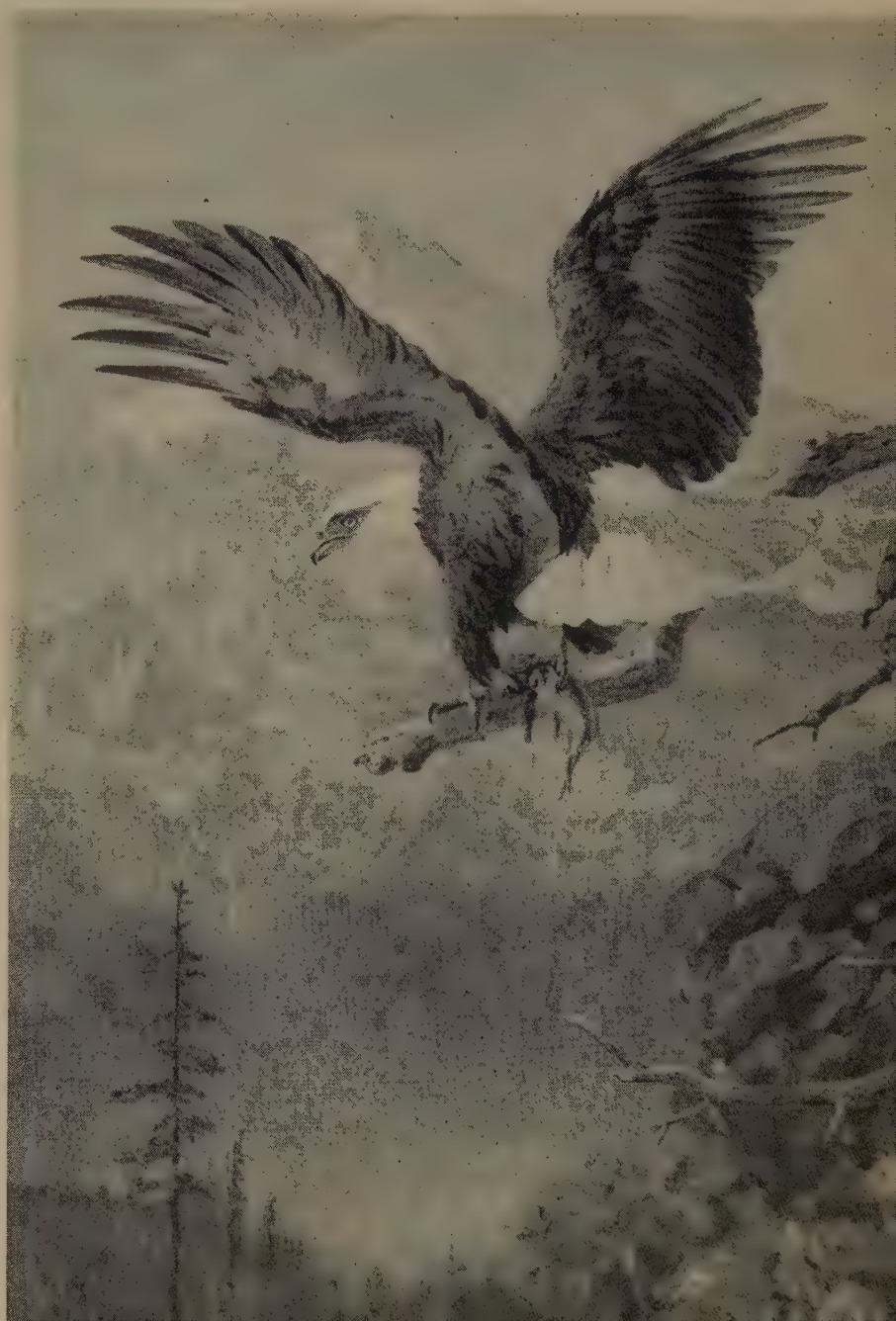
The female eagle lays two or three white eggs. The egg of a hummingbird is bigger! —that is, in proportion to the bird that lays it. Not three inches long, an eagle egg is smaller than the Canada honker's and only half the size of a whistling swan's. From such a small beginning grows the king of the air.

Both parents take turns at incubating, which lasts for about thirty-five days. Without stirring, one bird will sit as long as seventy-two patient hours. When very weary it will signal the mate with a chittering sound. Then the change of guard will be made swiftly and quietly. If an eagle must leave the nest unguarded, the sagacious creature will rough over the top of the nest with dead leaves to make it look deserted.

The eaglets, being born so small, have a long infancy. And the life they are going to lead is so much more complex than that of most birds that their education is long. At first the chicks get food popped in their mouths, but when they should begin to feed themselves, the parents tear up a fish before the youngsters' eyes to show them how to do it. Presently they bring a whole fish and stand back while the little fellows learn to dissect it themselves.

Eaglets in their nursery play with sticks, just as children play with toys, and learn to grasp objects with their talons. Before they can fly, they must first get rid of their gray down, and develop and preen their new, strong flight plumage. They are taught to exercise every day. Their parents show them how to jump up and down on the ample platform of the eyrie, flapping their wings. They do this by the hour, squealing and stamping the while, like children in a game. All this is preparatory to flying, and to fly as an eagle flies is something that, it seems, is learned only by weeks of practice.

At last the young eagles make a first terrified flutter beyond the edge of the nest. Usually they tumble back again as fast as they can, scared but apparently proud and excited. If they are too slow about trying again, the parents discipline them by withholding



The American Eagle. Reproduced from an original painting by R. Bruce Horsfall.

food. Shriek with hunger as they may, the youngsters are not fed, but tantalizing morsels are dangled just beyond their grasp. When at last an eaglet completes his first solo flight, he gets a reward of food.

Like girls and boys approaching maturity, young eagles, once they can fly, spend less and less time around home, until, toward the end of their first year, they go off to seek their own fortunes in the world. They do not mate until, in the fourth or fifth season, they begin to wear the snowy crest and white tail of the adult, but long before that they are on their own as masters of all they survey. Their tremendous wing spread of seven or eight feet is matched by the internal strength of their great pinions. The longest primary feathers are twenty inches long. The wing tips are slotted, that is, the eagle can spread the primary feathers apart like fingers.

This slotted wing tip is a feature of all birds that can soar, glide and even rise without flapping the wings. It seems to act as an anti-stalling device, much like the slotted wing of the airplane invented by Handley Page. He found that a slotted wing increased the maximum lifting power by 250 percent at an angle of forty-two degrees. Ages before, the eagle knew how to bend his wing upward and forward at the tip, with the result that the air is deflected over the wing top, leaving the main shank of the wing free to function several degrees beyond the stalling angle.

With such equipment the eagle is the absolute master of flight. Airmen have found him flying at 9750 feet above the earth. His marvelous eyes have been known to detect a fish three miles from the spot where he was soaring and capture it in one long slanting dive. It is this power that makes him the dread of the fish hawk or osprey, whom the king of the air frequently forces to drop his fish, the eagle recovering it with marvelous dexterity as it falls.

His fishing skill has also earned him the hatred of fishermen who will not share their luck. In Alaska, where reckless commercial exploitation of the salmon runs brought the canning industry to an all-time low, a bounty of fifty cents was the price put on the head of the national bird. Stringent laws regulating the take brought the industry back until it produced 8,000,000 cases a year. But the bounty, on the 20,000 breeding pairs of eagles officially estimated to remain in Alaska, was raised to a dollar anyway.

The eagle was officially placed on the Great Seal of the United States by act of Congress on June 20, 1782.

The eagle has many dangerous enemies—all of them human. Since Congress gave it the kiss of death in 1782 by publicizing it as the national bird without giving it legal protection, the eagle has had to fly through a barrage of lead and raise its young in the midst of its ill-wishers. For a century eagle eggs were at a premium with the class of collectors who rightly call themselves "fanciers." And unnumbered thousands of dusty, moulting, stuffed eagles still adorn the top shelves of drug stores, barber shops, and country offices. Every farmer who misses a hen thinks, if there is an eagle nest about, that he may pay it a punitive visit. Added to injury is libel—a charge so criminal that if it were true it would justify the vicious attacks on every eagle pair. But there is no truth in the hoary newspaper story of the eagle who snatches the baby from the cradle. No American eagle has ever been known to make an unprovoked attack upon any human child. For twenty-five years the National Audubon Society has patiently followed up each one of these accusations, and every case melts away to fable.

Only in the last few years did Congress get around to passing legislation to protect the symbol of our proud freedom. Except in Alaska, it is now unlawful to kill, or shoot at, or capture Uncle Sam's birds, or to take eagle eggs or molest the nest. The enforcement of this law is no stronger than the vigilance of game wardens and the attitude of country judges.

So, if you ever find an eagle's nest, rush right home and tell—nobody. News of it will spread from your best friends to the eagle's worst enemies. Every hunter who thinks he must kill whatever fair and shining mark dares stir, every curiosity-seeking robber, will learn of it. When you come to the nest again there may be no eagle. Then you can take a silver dollar out of your pocket, or a quarter if you are feeling cheap, and apologize to the brave emblem. But the American sky over your home will be lower than it was.

In spite of all that Americans have done to exterminate their grandest bird, it is still not uncommon in certain localities, and it is most abundant in Alaska and Florida, around the Great Lakes, along the Mississippi river system, and along the coasts of the two oceans. Wherever you saw it, you never forget your first American eagle.

He may be sitting in (Continued on page 53)

"Peace", new rose introduction by Conard-Pyle, has been awarded All-America honors for 1946. It is a yellow, many-petalled bloom, suffused with pink.

Behind the Seed Catalog

By ANDREW S. WING

ROBINS, bluebirds, crocuses, and the skunk cabbage by the stream, are among the traditional harbingers of spring to those who live in the north. Yet, earlier than any of them, comes the seed catalog, bringing promise of spring to a region of frozen ground, of snow and ice. Gardeners are planners, and about the time the Christmas tree ornaments are being put away they begin poring over the seed catalogs that arrive on the heels of the holiday greeting cards.

No calling is more fundamentally essential than that of the seedsman, or, perhaps, so little understood. A common impression of the making of a seed catalog is that the merchant grows a lot of seeds, then lists what he has to sell, along with pretty pictures, prices and a smattering of cultural advice. Some small, local concerns may do it that way, but in the big mail-order seed houses the catalog is a major effort involving many people and consuming many months of planning.

The beautiful orange tomato on the cover of this catalog, or the gorgeous new zinnias on the cover of that one, did not get there by chance. Years of plant breeding, selection and careful production of the seed itself are behind the pretty lithograph on the cover of the catalog, and the other pictures within it. Some new varieties or strains of cultivated plants may, now and then, "just happen", thanks to the casual visit of some insect pollinator. Or a self-fertilized plant may produce a "sport" or mutation.

Many of our older, and some of our best modern varieties, came about by such chance, but the trend today is toward the scientific mating of plants, the creation of superior strains by what might be called "planned parenthood." The new, inbred strains of sweet corn and other vegetables are outstanding examples of what is being done by plant breeders of our leading seed firms, and by government and private research organizations.

The new and improved varieties have been bred for special purposes. Disease resistance is an important factor. In vegetables, earliness, flavor, appearance, shipping and market qualities are also vital considerations. The freezing qualities of vegetables and fruits is another matter that is receiving much attention as deep freezing comes more into the food picture.

When a new variety is created it is usually not offered to the public until it has been given a thorough test under varying conditions of soil and climate, and in different sections of the country. In order to give the new varieties a careful, impartial test under diverse conditions, a cooperative organization known as All-America Selections has been set up. Samples of the new variety are sent to seed-testing stations in many parts of the country. Each sample of seed has a number, but no name, and its originator is not announced. After a thorough testing, the new variety is given a rating. If good enough, it receives a silver or a bronze medal. Just to receive a rating as an All-America selection is a high honor for the originator. It means recognition for his new creation from the start, and assures profits from wholesale as well as retail sales.

All-America selections this year include four flowers and one vegetable—a petunia trio contributed by W. Atlee Burpee Company, a dianthus from Bodger Seeds, Ltd., and a snap bean from Rogers Bros. Seed Company. The silver medal goes to

Removing stamens from the tomato blossom (left), and (right) pollen from the male parent being placed on emasculated female flower to produce the Burpee Hybrid Tomato below. Such work is behind the seed catalog.

petunia "Colossal Shades of Rose"; the dianthus is named "Westwood Beauty"; and the bean is "Longreen."

Those new petunias sound like something quite special. "Colossal Shades of Rose" is the first giant, all-double petunia ever created in America, and is the biggest petunia ever known, many blooms growing more than five inches across. In the past we have leaned rather heavily on the Japanese for petunia creations.

Among new varieties, do not overlook the new rose introduction, "Peace." It is a creation of the French hybridist, Francis Meilland. In 1942 it was rated "the finest rose in France. Conard-Pyle brought it to this country, and it has been awarded All-America honors for 1946, being acclaimed by rose breeders and fanciers everywhere. It is a yellow, many-petalled flower, suffused with pink. At the United Nations Conference in San Francisco, a specimen flower of "Peace" was presented to the head of each delegation by the American Rose Society—an appropriate gesture, at such a time, for a lovely flower with a name that is a symbol of hope for all mankind.

W. Ray Hastings, executive secretary of All-America Selections, predicts a bright future for new creations since many new varieties have been held back because of wartime shortages of labor and other difficulties. "There were forty vegetables and thirteen flowers under test in 1945 compared with the normal prewar average of about 60 vegetables and 70 to 80 flowers," he says. "With peacetime we may expect some fine new kinds to be entered in the near future from holdbacks and new developments." In short, there has been a wartime lag in horticulture just as there has been in the production of new cars and household gadgets. But the basic research has been going on, and eventually we will be offered the usual number of fine new plants every spring.

The great impetus given gardening by the Victory Garden program during the four war years has created a greater interest than ever before in the growing of plants for food and beauty. To supply

College girls work at a summer job of pollinating by hand tomato blossoms on plants that are grown experimentally on the Burpee acres at Fordhook Farms near Philadelphia.

these gardeners, new and old, we may expect newer and finer horticultural creations.

Typical of the amount of effort involved in scientific plant breeding on a large scale is the employment, by one of the large Philadelphia seed firms, of eighty-four college girls to do nothing last summer but hand-pollinate cucumber and tomato blossoms. Tomato blossoms are quite small, and, to prevent self-pollination, emasculation and hand fertilization must be done. The process with the larger cucumber flower is almost as painstaking. Thus are the new hybrid varieties being created.

But to return to our seed catalog. Work on it is started in mid-season by the heads of various departments. Usually these men meet in several conferences to decide just what the offerings are to be for the coming year. Less worthy varieties may be dropped in favor of newer, improved sorts. But dropping an old variety is not as easy as it might seem. Most seedsmen list hundreds of old varieties that would not be needed if they could persuade customers that the newer varieties are better.

Gardeners cling to an old variety, such as Black Mexican corn or a stringy, tough bean, just because grandpa grew it and they liked it as a boy. The old favorites among the flowers continue to be popular long after newer and better sorts have been introduced. That is one of the reasons why a big seed catalog will list from 3000 to 5000 separate items, all of which must be collected, tested, carefully labeled, and stored, packaged, priced and described in the catalog. If a mistake is made, especially in price, it is a serious matter indeed.

The actual writing of the catalog may be done by one man, but it represents the collaboration of perhaps a dozen individuals. The writing of the copy may start in August and will continue through the autumn months, with continual revisions to keep it up to date. Perhaps there is a short crop, or a total failure, of a certain variety. A new introduction may be held up until the next year, thus making important changes in the catalog necessary. Photographs and colored illustrations must be made or arranged for, and all copy must be carefully written and cut to fit the exact space on the page where it is to appear.

The paper shortage has seriously affected the horticultural industry, as it has many other businesses. Catalog pages have had to be curtailed, and the number of copies printed limited. There has been even a shortage of paper for seed packets. Considering the basic need for the seed business, it was unfortunate that seedsmen had to fight to get materials to keep their establishments going. One nursery even offered to buy back its catalog for redistribution. When a single concern distributes as many as a million catalogs, it will be seen how important the publication is as a silent salesman.

When your catalogs come, look them over carefully. They make fascinating reading. And they are full of good news, too! How refreshing to read something that is full of optimism and constructive ideas; never a negative note! After a quarter of an hour of catalog-browsing, one feels that, armed with a spade, a hoe and a few dollars worth of "Bumper Crop Seeds," he could go out and grow enough to feed all the starving Germans, Poles, Russians, and a few other lesser nations thrown in. And the quality! —such succulent peas, such sugar-sweet corn; what wonderful watermelons; flowers all visions of delight. Bugs, blights, and the other hazards of the home-gardener are rarely mentioned. But that is pardonable. After all, there is no place for pessimism in the philosophy of the farmer. If he worried about what might happen to his crops before he planted them, the chances are he would not plant at all. The good seedsman has to be a good salesman or he would not stay in business. And his catalog is his show window.

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This photograph of Ivor's bluejay anting is by Hugh M. Halliday of Toronto, Canada, and is believed to be the first picture ever taken of a bird indulging in this ornithological phenomenon.

Antics of Bird Anting

By H. ROY IVOR

"ANTING? What do you mean by anting? I never heard of it before." This is the reaction of most bird lovers when this most spectacular, peculiar, and least understood item of bird behavior is mentioned. It illustrates, too, the rarity of this antic, or so we might judge from the few reports of its observance. Yet, perhaps half of our passerine birds indulge in this extraordinary performance at times.

Briefly, anting is the act of a bird in picking up an ant and rubbing it on the under side of the outer primaries or the tail. The word "anting" is a comparatively new coinage. In 1935 the German ornithologist, Stresemann, proposed the German equivalent to describe dressing the plumage with ants, or apparent substitutes. In 1938 W. L. McAtee of the United States Fish and Wildlife Service suggested restricting the word "anting" to the act involving ants only, and this has been generally accepted by ornithologists.

The first known reference to this odd behavior is that of M. Abbott Frazar in 1876. He reports that a tame crow "deliberately takes his stand upon an ant mound and permits the ants to crawl over him and carry away the troublesome vermin."

Literature on the subject is scarce, probably due to the fact that so few have been fortunate enough to observe the phenomenon, or, observing it, have not realized its significance. Up to 1938, mention of it had been made, so far as can be ascertained, in some twenty-odd publications, mostly of German origin. Reports of observations have been made also from Australia, India, England and the United States.

Since then it has aroused considerable interest among ornithologists, but few have seen the performance.

From 1876 to 1941 anting had been reported in seven passerine families and seventeen species. Observation in my aviary during 1941 practically doubled this number by adding three more families and sixteen additional species. Since 1941 I have added four more species, and other observers have added three or four.

The performance is so rapid that it is difficult for the eye to follow it. This probably is the cause for the great divergence of opinion among observers as to where the ant is placed or rubbed. This, in turn, leads to numerous erroneous inferences and guesses as to the object of anting. Observers have stated that the ant has been rubbed upon, or placed among the feathers on almost all parts of the body except the top of the head, an obviously impossible spot to

The two pictures on this page are enlarged from motion pictures taken by Dr. W. W. Hughes of Embro, Ontario, Canada. The bird at the upper left is a Baltimore oriole that has just anted and is discarding the ant. The black spot just in front of the bill is the ant.

reach. Some suggest that the bird uses the formic acid of the ant to drive away ectoparasites; others that it swallows the formic acid to kill internal parasites; others that the object is to dress the feathers. So far as my observations go, not one of these theories will "hold water."

To determine exactly where the ants were placed or rubbed, and, if possible, why, I carried out a series of experiments, using four species of ants. Because many of my birds were hand reared and exceedingly tame, I was able to watch hundreds of performances at a distance of sixteen inches, sitting or lying beside the birds and even having them ant on my hand.

Close as I was to the birds I found it difficult to follow the movements. It was not only distracting to have so many birds performing at one time on a space of some four or five square feet, but the performance was so rapid that it was impossible for the human eye to follow the movements accurately. However, by intensive observation of scores of antings, what was missed in one performance usually could be seen during the others—that is, so far as the eye was capable of following the action.

The moment an ant was sighted by any bird that

The bird at the left is a female rose-breasted grosbeak that is just ready to ant. The ant is in the bill, and the bird is sitting on its tail and also has a foot on its tail. The speed of this act of anting is too fast for the human eye in some details and taxes a slow-motion camera.

anted, there seemed to be an instantaneous and instinctive reaction. The ant was picked up and held in the tip of the bill; the eyes were partly closed; the wing was held out from the body, but only partly spread; the wrist was drawn forward and raised, thus bringing the tips of the primaries far forward and under, to some extent, on the same side as the extended wing, often so far that the feet were placed upon it. While in this position the ant was swiftly rubbed, in a single stroke, down the ventral surface of the primary, beginning about two-thirds from the wrist. Although the positions assumed by a bird varied somewhat, there was no variation in the placement, with the exception that once I saw an ant rubbed on the tail.

With few exceptions the ant seemed to be used only in a single stroke down the primary. It was then eaten or discarded. Once I saw a Pekin robin rub an ant on the primary five times before eating it, and several times noticed a bird use the same ant on the primaries of both wings. There seemed to be no fundamental differences in the specific actions of families, species, or individuals, the only variation being in position. This seemed to be determined by the extent to which the tail was drawn forward. Although there was always tail action, it varied from a slight movement to as far forward as was physically possible.

What we know as preening was absent during the performance, and only once did I see preening immediately after anting. On this occasion a female indigo bunting flew to a perch and went through all the actions of drying herself as after a bath.

It was found that many species that ate ants did not ant; that some species of a family anted while others did not; but that all individuals, of a species that anted, were likely to practice the habit.

Enthusiasm for anting seemed to vary with the season, although this was not consistent. Little interest was shown during the winter or early spring months and during the late summer and fall.

The performance is comical, fascinating, and of extreme beauty, particularly when such birds as rose-breasted grosbeaks are anting. Then the vivid beauty of their under wing coverts shows to striking advantage. The position the bird assumes is extremely awkward for them, and one would think it decidedly unnatural. The tail being extended under their abdomen often causes them to lose balance and tumble on their backs or sides. This tumbling is notable in song-birds. Often they bump into each other while performing, yet this causes little animosity. In fact animosity seems to be almost forgotten, even between quarrelsome birds. The performance is so extraordinary, so foreign to any other behavior of birds, and so clownishly beautiful that it almost brings tears of laughter.

Slow motion pictures confirm my conclusions that ants are not rubbed on any part of the body except the wings and tail, and are not placed among the feathers. Proof of this seems to preclude the possibility that the ants, or the formic or citric acid that they exude, are used for any of the purposes suggested by previous observers. So far, after intensive investigation, I am unable to make a single plausible suggestion as to the biological significance of this exceedingly peculiar behavior, and I am compelled to agree with McAtee who states: "The phenomena involved in anting . . . are both remarkable and obscure, and whether we shall ever understand their exact significance is doubtful."

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A Pilot Watches the Rise of Night

By LOUISE LEIGHTON

Night does not descend, nor darkness follow;
Night creeps upward, fills each vale and hollow;

Then field and stone and forest, house and tower
Grow dim, dissolve, within this vesper hour.

Still upon the earth the waters gleam:
Lambent lake and river, chromium stream.

Eastward before me like a circling ledge
Earth's shadow reaches outward from the edge.

All land and water blacken, disappear,
But skies are like a fluid, glimmering near,

Until the sun sends forth a last reply
And blackness swarms around me as I fly.

Yet never in total darkness do I drive,
For with the day's departure, stars arrive.

I look with awe upon their ancient glow
And tiny earth-lights shining far below,

And whisper: God, the universe is full
Of Thy bright glory, endless miracle.

In late spring the doe steals off alone to her solitary forest couch where the fawns are born, about seven months after mating and usually in June. The fawn weighs about four pounds, and remains in hiding for several weeks. Lying still on the forest floor, it looks like a brown log, sunlight-flecked.

The White-tailed Deer through the Year

As Recorded by Walter J Schoonmaker

THE white-tailed deer is the earliest and the best known of our North American species of hoofed and antlered mammals. In pioneer days no wild animal played so important a part in helping the settler than this one. But its reign as an aid to those developing the wilderness was relatively short. The demands of an increasing population that knew no closed seasons or bag limits, or had any feeling of personal responsibility for the future of

The doe may become a mother on her second birthday. Young females usually produce only one fawn. Later, twin fawns are the rule; rarely, there may be triplets.

our wildlife, were soon evident. Before the beginning of the present century the virtual extirpation of the species in most of our states had taken place. This condition was perhaps more pronounced in our eastern states, and especially in those where intensive lumbering operations were carried on. In Vermont, for example, the white-tailed deer was practically exterminated about 1870, and New Hampshire, Massachusetts, Connecticut, New York and Pennsylvania had deer only in their wilder parts.

Somewhere between the late seventies and the late eighties, the date depending on several factors, conditions changed. The states that still had some deer began to protect them, and some of those that had none imported a few, and protected these. Summer shooting was banned. Sale was forbidden; bag limits were established.

The very destruction of the forests worked for the increase of the white-tail, for the great lumber camps no longer drew on their numbers, and the new growth that followed the harvesting of the old forests provided a great abundance of succulent browse.

With the passing of the primitive forests the natural enemies of the deer disappeared. First to vanish was the cougar, whose range was coterminous with that of the deer, its normal prey, and later the wolf. Thus the deer has been able to extend its original range somewhat to the northward, and also to regain much lost ground toward the south.

Deer again began to be important as soon as our motorists began to see an occasional animal from the highways, and they gained a new value. Soon some of our states began to wonder whether a live deer, with its obvious esthetic value, was not worth more, even economically, than a dead one.

While this question has never been answered, once and for all, and perhaps never can be, for conditions are everywhere different, the more moderate of the two classes of our citizens interested in deer have cause for satisfaction. These classes are those who hunt the animals as game and for sport, and those who do not, but value the deer for their beauty and their place in our wild-life population.

Graphic proof of the esthetic charm of the white-tailed deer is to be found in the pictures on these pages. From these the reader may choose which kind of shooting he would prefer—gun or camera. It

When a few weeks old, the fawn begins to follow its mother. In all the woodlands there is nothing more lovely than the innocent gaze of a fawn, looking upon the world with soft brown, wondering eyes.

should not be difficult to decide whether the greater skill is needed to make such photographic records as are found here of these beautiful, alert but trusting wild creatures, or to kill them with shotgun or rifle. Such animals may be photographed many times and enjoyed thus by thousands; they may be killed only once.

The story that is told in these pictures is one of deep forests and grassy meadows, far from the haunts of man and, again, in his very dooryard. On the shores of mountain-hemmed lakes the summer campers delight in watching the feeding of the red-coated creature. In October, on the same shores, the

By September the fawn is slender and graceful, but strong and sturdy and exquisitely beautiful. On slender legs it races through the forest, bounding up steep slopes and floating with ease over windfalls. As September wanes, the fawns are weaned and the dappled coat is changed for one of more uniform grayish-brown. Now the child is colored like its mother.

animal, now in its blue gray coat, is coveted by the hunter. Golden autumn is the mating season, and while the hunter stalks his quarry, the white-tail buck steals through the forest over yellow beech and scarlet maple leaves seeking his mate.

Then comes winter—white, beautiful and cruel. No longer does the hunter pursue the deer, but exposure, cold and hunger are ever-present foes.

The picture story told here is by one who, by the grace of the Red Gods, has been able to capture on film the beauty of one of Nature's loveliest creatures. The story begins in June—usually early June—and carries on through the seasons.

Usually early in winter the antlers break off flush from their bony base, leaving round, raw, sore-looking spots. Both may be dropped at nearly the same time, or several days apart. Some red bulbs of living, blood-filled skin appear, and the antler growth has begun. This young buck has its first, or second year, antlers. Does normally have no antlers. By late summer the antlers are fully developed. While growing they are covered with a protective, fuzzy substance known as "the velvet". As they harden this covering dries and is rubbed off by the deer

When, usually in early October, the maple and oak leaves have turned to scarlet, the mature buck is fully armed with hard, gleaming, sharp-tipped antlers. At this time he ranges through the forest, seeking the does, and willing and anxious to wage battle with other bucks.

The scarlet and gold leaves have fallen. Ripe apples, beech nuts and acorns drop on the ground to make the forest a land of plenty, and the deer grow fat. Both young and old have assumed the gray winter coat. Stray leaves skim across frozen woodland pools and cold winds bend sturdy oak branches. Soft snow blankets everything on the forest floor, and weighs down the evergreen boughs. The season of hardship begins. Any buried food must be dug out and the deer's main reliance is browsing on branches and sprouts.

Flicker Feeding

By SAM KNIGHT

AMONG the common winter birds of the mountainous and semi-desert region of south-central Arizona is the gilded flicker, *Colaptes chrysoides*. It is much like the red-shafted flicker except that the under sides of the wing and tail are yellow. In habits and call it is otherwise about the same as its flicker cousins.

Winter feeding of this bird offers a fine opportunity to observe and photograph it. We found that the flicker definitely prefers meat or suet, but grapefruit, orange, or apple are not spurned.

The male flicker at the top is contemplating the suet, while several other birds wait impatiently for a peck at it. The female seemed to enjoy eating upside down. The flicker on the ground was snapped while she studied the camera contraption, thus we were able to get a pert face-on view.

Another visitor to the feeding tree was a Gila woodpecker, *Centurus uropygialis*, a male with a red forehead. He liked the grapefruit that was hung above the suet. Unlike the flickers, these woodpeckers could be attracted with bread crusts, which they took to the cross-arm of a clothes pole to eat.

The Gila woodpeckers took second place to the flickers at the feeding place, so the other birds, including the cactus wrens, often had quite a wait for their turn. They wasted no time, however, when the coast was clear.

These photgraphs were taken through a hole in a shack a few feet away from the feeding spot in the tree. The lens was always the object of curiosity and some misgivings, but noise in the shack seemed not to bother them.

Mapping the Unmapped

Photograph by U. S. Army Air Forces

A MAP covering approximately 292,000 square miles of northern Alaska, four fifths of which have been previously virtually unmapped, has been made by the Army Air Forces in cooperation with the U. S. Geological Survey. This has been done by what is known as Tri-Metrogon mapping from aerial photographs, a highly intricate and scientific process.

The photographs are taken with three wide-angle cameras mounted in a plane so that three simultaneous exposures on negatives nine inches by nine inches can be snapped covering an area from one horizon to another. The central camera is pointed vertically downward, and the other two are pointed obliquely right and left so that the respective horizons will show at the upper edges. Successive exposures are taken along the line of flight with enough overlap to satisfy stereoscopic requirements and insure continuity over the whole terrain. Parallel flights are spaced approximately twenty-five miles apart.

Here is shown an unnamed glacier, a fifty-mile-long geological "orphan" photographed by the method described. In order to paste this together in a continuous strip it was necessary to distort the picture slightly at the points of juncture where there is more of a curve than can be shown in the space available. This strip, however, gives a graphic example of this horizon-to-horizon photography, with the propeller housing of the plane shown at the upper and lower right.

This Alaska map covers the largest area ever mapped and fixed in geographic position as a single unit. It includes the area extending from the mouth of the Mackensie River, in Canada, westward to the Arctic waters separating Alaska and Siberia, southward to Fairbanks and northward to Point Barrow.

Gunners Crave Publicity

A RECENT issue of *Conservation News*, publicity leaflet of the National Wildlife Federation, avers that the "sportsmen of America are a pretty modest group," and that, "dollar for dollar put into their hunting and fishing, they get less publicity, less public interest and less projects than any other sport." Gunners and fishermen, it is pointed out, spend $60,207,318 for guns, ammunition, fishing tackle and other related equipment. In contrast, all other sports, from baseball to croquet, use $61,647,986 for equipment.

Most of these other sporting activities, the article protests, receive vast publicity in newspapers and magazines, while many hours of radio time are given to baseball, football and prize fights, "yet only occasionally is there brief mention of hunting and fishing." This, the Federation organ feels, is because hunting and fishing are not organized as commercial sports, and should not be. The item adds: "If we could reduce to public interest these projects for wildlife perpetuation, if we could catch the public eye with the vast importance of wildlife management, our sport, too, could get the attention in the press and over the air that it richly deserves."

This question of more publicity for hunting and fishing is also worrying the Outdoor Writers Association of America, which is predominantly an organization of rod and gun editors. This group is actively at work to get a more generous allotment of newspaper space for the writings of their members, on the ground that publishers and editorial directors are unappreciative of the extent of public interest in hunting and fishing.

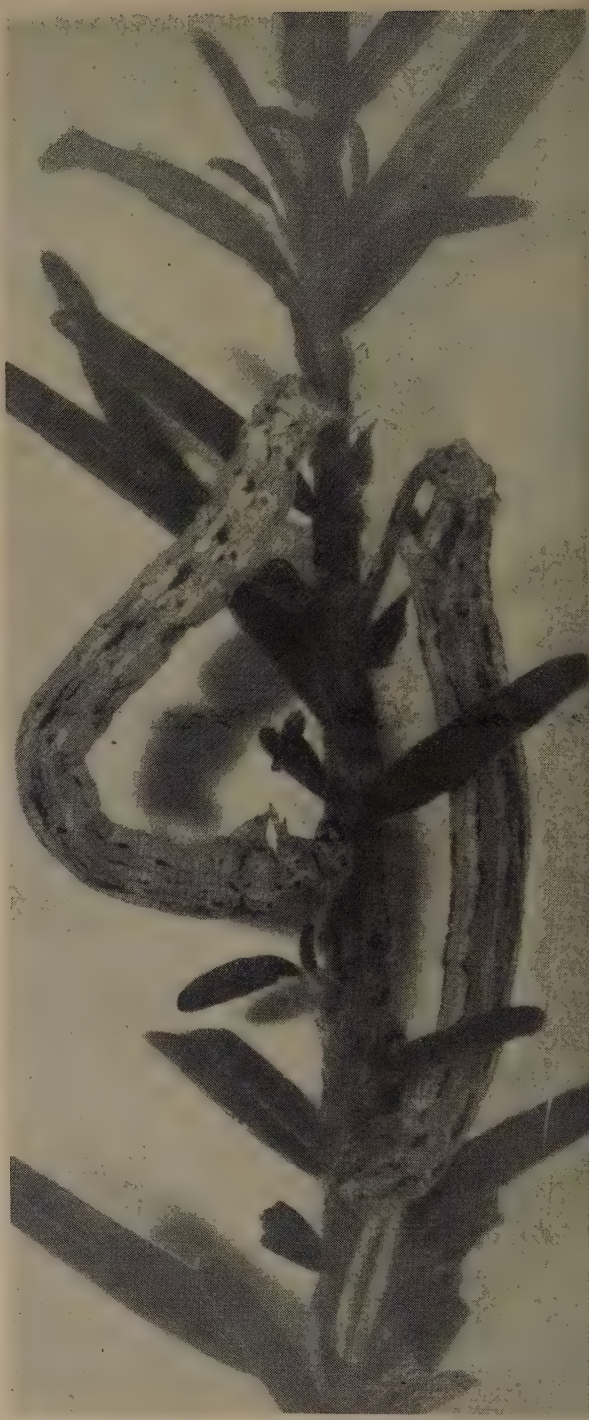
First as to the Federation's plea. Modesty has never popularly been regarded as an attribute of the gunner, or the fisherman, and certainly they are not modest in claiming rather more than their share of the country's wildlife, supposedly the property of all the people. So far as publicity is concerned, there are several extremely successful hunting and fishing magazines, with large circulation, and loaded, cover to cover, with profitable advertising of guns, ammunition, fishing tackle, sport clothing and liquor. No other sport supports any such comparably successful magazines. Citation of the equipment investment for baseball and football ignores the fact that their money significance derives from the fact that they are essentially spectator sports. Others of the sports require expensive links, courts, rinks, gymnasiums, alleys and slides, all of which do not come under the head of "equipment." By and large, the gunner uses the public land, or some individual's land, for his sport, and the fishermen the streams, paying mighty modest license fees to the States for the privilege. Figures can be made to prove many, many things.

Comparing hunting and fishing with other sporting activities—even listing them together with golf, baseball, football and croquet—is questionable. Gunners must have a live target to kill; fishermen an active fish to catch. There may be some modified mayhem in football and ice hockey, but killing is not the main object. This difference, in our opinion, sets hunting and fishing apart; places upon their practitioners a responsibility of restraint too often not recognized. They are using a natural resource in their sport, supposedly harvesting the surplus but actually, in many cases and many places, reducing the numbers of wild creatures that are of interest to the non-shooters, who constitute the majority of the people.

We are speaking of the body of gunners and fishermen as a whole, not the minority who are alive to the necessity of careful regulation of the kill and catch. Yet the term sportsman is loosely applied to all who carry a gun or wield a rod. This informed minority is certainly entitled to more publicity where it will do an educational good, but the majority of gunners are a liability to them.

Many of the members of the Outdoor Writers Association are alive to the need of a real conservation view with respect to our wildlife population. We would like to see them given wider opportunity to promote this viewpoint. Our only quarrel with this organization, in which we hold membership, is that it harps continually on more space for the "writer on the outdoors," taking outdoors to be synonymous with hunting and fishing only. It is our conviction that anyone who writes with authority and sincerity about wildlife itself—not necessarily as a target—about parks, forests and outdoor America generally is an "outdoor writer." Such writers are in a minority, and, indeed, in a restricted classification, in the O.W.A.A.

It is about time that the false whiskers were taken off the term "sportsman," and, for that matter, the title "outdoor writer," as currently used. In the first instance, the true conservationist among gunners and fishermen should be jealous of the word, insisting that it be applied only when the individual could be proved entitled to it. In the second instance, the hunting and fishing writer should broaden his viewpoint—if he is to be entitled to be called outdoor writer—and should be willing to join hands with *all* writers on the outdoors, adding their talents to his own in educating the public to an interest in and appreciation of wildlife and conservation. It would be well also to check the present tendency to use the word wildlife as synonymous only with game birds and mammals. Conservation would be immensely aided, we believe, if things were called by their right names.



Flying just over the tree tops, a spraying plane makes a run over the heavily forested Clatsop tree farm. At the right, a close-up view, about four times magnified, of two hungry hemlock loopers working on a twig of their favorite meal. The actual size of these two specimens was about one inch.

Blitzing the Hemlock Looper

By HAROLD OLSON

Photographs by Stan Spiegle

★

BILLIONS of worms with a lusty appetite for greenery got the lethal dose this past summer in Oregon. Thereby a forest was saved, and a great tree farm was spared from destruction.

A tree farm, as most people know, is a place where trees are grown as crops to keep forest industries supplied with timber. There is a growing number of tree farms in America, especially in the far West and South. Near the ocean beach in the northwest corner of Oregon is the 118,000-acre Clatsop Tree Farm of the Crown Zellerbach Corporation. It is an especially productive forest, set up and managed to yield ninety million feet of timber every year, continuously. This helps supply the corporation's busy pulp and paper mills with a flow of raw material.

Clatsop Tree Farm is good for that much wood annually, forever, providing man gets the timber for productive use. But in 1944 a destructive natural forest enemy, a tree-killing insect, established a beachhead in that region, ate the life from forty million feet of timber and posted ample sign that it meant to multiply enormously for the 1945 feeding season. Obviously this would throw out of gear the orderly, sustained-yield program of the tree farm, as well as cause serious losses in surrounding woods in other ownerships. So, something was done that can well stand as a model of cooperative battle against destructive forest insects.

The culprit in this instance was the hemlock looper. It struck suddenly, unexpectedly. There had been

At this field laboratory deep in the forest, R. L. Furniss, entomologist (left), made studies of the hemlock looper, its life cycle and its dietary habits, to gather information upon which to base control measures.

nothing to indicate anything unusual. The insect seems to be ever-present in the western forest and is kept under control most of the time by Nature's own forces.

In the summer of 1944 reports of insect damage began to come in to the forest insect station of the U. S. Bureau of Entomology and Plant Quarantine in Portland. Those from coastal Oregon brought technicians from the bureau, who quickly identified the defoliator as the hemlock looper, commonly known in the caterpillar stage as measuring worm, inch worm or span worm—an insect with a truly bad record. In the scientific world the name is *Ellopia fiscellaria* var. *lugubrosa* Hulst.

Like many other forest insects, the looper can build up to fantastic populations. Since feeding by the young larvae is not very noticeable, it is usually not until the heavy feeding season of late summer that the forest begins to look sick. At that stage the maturing caterpillars devour anything green. They prefer hemlock needles, but are not too choosy. As they munch their way through the foliage they kill tree after tree. Where they have marched in numbers the forest is scourged as by fire.

They were there in a multitude, all right, but there was no chance to stop them in 1944. It was the beginning of a serious outbreak, and control was clearly a job for 1945. By early fall the insects, true to form, went into the moth stage, and before long there was a veritable blizzard of moths buzzing over the area, even in the streets of Seaside. In this stage eggs are laid for next year's generation. A bumper crop was indicated. When the last of the moths had given up the ghost along about mid-October, creeks and rivers were brown with them, tree trunks were plastered, and pot-holes in the roadways were thick with their dead bodies.

Thousands of conifers had been stripped clean; others partially. Some of the partially defoliated trees stood a chance to recover; the fully stripped trees were through. During October and November, Crown Zellerbach foresters cruised 12,000 acres. Reconnaissance flights covered all suspected areas. From all information gathered it was reckoned that 12,000 acres were infested in some degree, with 2500 acres heavily infested. Outright timber kill was set at 40 million feet, with much more partially defoliated.

The immediate problem was to salvage the timber already killed. This called for quick action, since deterioration sets in fast in the coastal fog belt. In fact, it was a case of getting the timber to the mills within two years or losing it.

At the same time, it was clear that if another, and still heavier, looper infestation occurred—as appeared likely for the summer of 1945—the salvage job would become too great for war-limited logging facilities; there

Looper control measures saved this fine forest from destruction. This stand of western hemlock and Sitka spruce is about fifty years old and already runs about 110 cords of pulpwood to the acre. The new forest, growing among the stumps of the first harvest, is Nature's own handiwork.

Logging out the looper-killed timber before it becomes a total loss. Close recovery like this resulted in salvage of almost all of the dead timber and left the land in good condition for natural reproduction.

would be a heavy loss of wood; the management plan would be upset.

So crews and equipment went into the looper kill, and by the first of the year salvage logging was under way. Despite manpower shortages, intensive recovery of wood was the rule. Under a deliberate policy of the cleanest possible logging, every bit of wood usable at the pulp mills, down almost to faggot size, was taken out. Such methods stretch the wood supply, reduce the post-logging fire hazard and leave the land in good condition for natural restocking. Toward the end of the summer of 1945 it was announced that the salvage situation "was in hand," and the bulk of the "bug-kill" could be recovered and put to use at the pulp mills.

Meantime, there was the problem of stopping the epidemic. Early in 1945, foresters and entomologists met in Portland to draw up plans for a cooperative insect control program under which united action could be taken against the looper as well as any other destructive forest insect. Under guidance of State Forester Nelson S. Rogers a bill enabling the state to participate in control work was submitted to the legislature in February. The measure was enacted under an emergency clause putting it into effect at once. Federal legislation along the same line had been recommended. Three-way cooperative effort—federal, state and private—is the ultimate goal.

Rogers' first step under the new law was to declare a zone of infestation in which the state could proceed with control work with the land owners paying 75 percent of the costs, the state 25 percent and furnishing management, and the Bureau of Entomology and Plant Quarantine contributing technical services in the field. On that basis a project for spraying the threatened areas with powerful insecticides was set in motion.

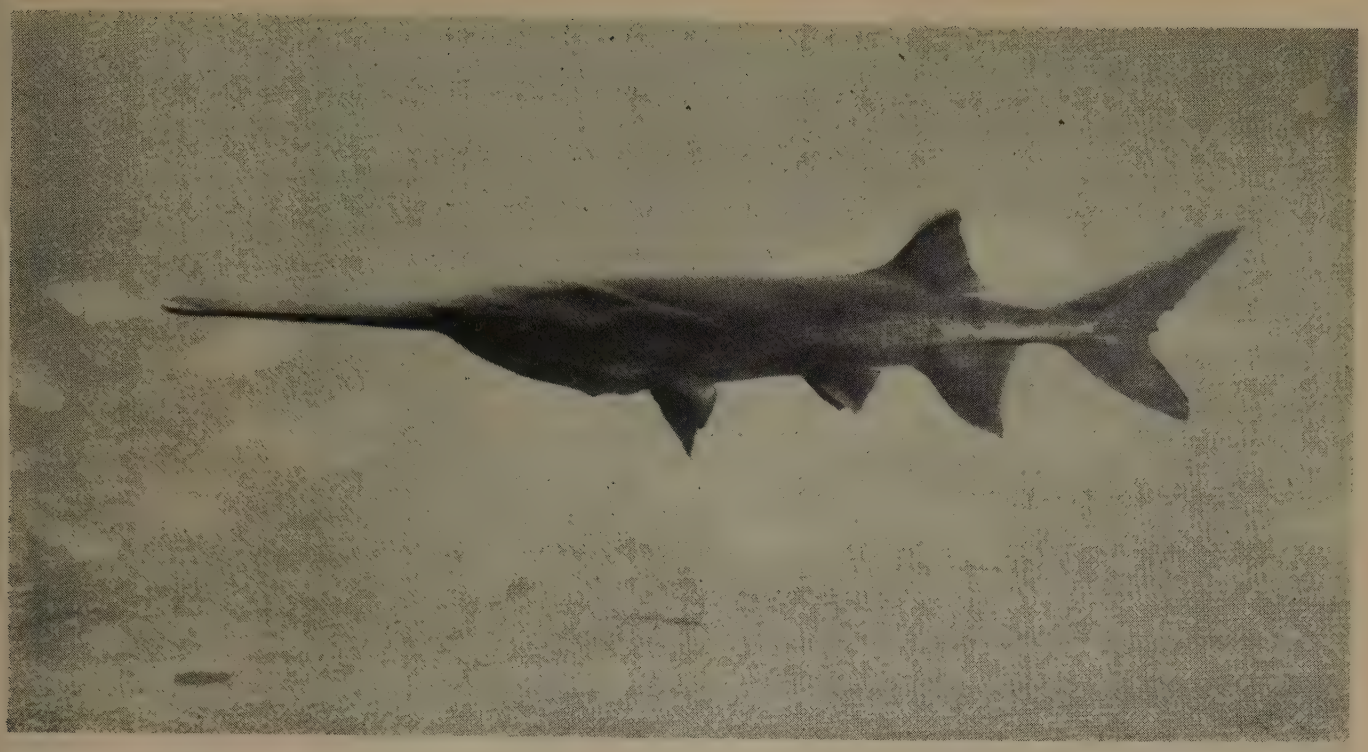
Central Aircraft of Yakima, Washington, a firm specializing in farm dusting and spraying work for twelve years, was hired to apply the chemicals. Some DDT was obtained under WPB authority for "experimental purposes." For the bulk of the job it was lead arsenate. An airstrip was fashioned on a long-abandoned beach golf course. Part of the runway had to be planked, but since the spray pilots were old hands at the game and could get by with a minimum of facilities, the strip in no way resembled an airport. A mixing plant was set up. John B. Woods, Jr., assistant state forester, was put in charge of the project by Forester Rogers. Entomologist R. L. Furniss and his versatile aide, Walter Buckhorn, who can do most anything in the woods including high-climbing, moved in.

Headquarters and a field laboratory were set up; incubators, rearing cages and other gadgets were installed for close scientific study of the insect and parasites. Hemlock limbs around were draped with small cloth cages fencing in loopers for development data. Scattered through the infestation region were nearly 100 horizontal test screens, on which the catch gave the clue to how many loopers perished.

In mid-June spraying started. Two planes carried chemicals in a front cockpit tank. The pilots flew just over the tree tops, each trip spraying a strip 60 to 75 feet wide and about four miles long. White flags, set in the very tips of tall hemlocks by Buckhorn, helped keep the flights on course. Topographic features like the edges of cuttings, roads, bridges, rivers, ridges, buildings, and such, also served to keep the planes lined up. Since brisk northwest winds usually sprang up before noon, the working day was mostly from 6 to 10 in the morning. For a while, flying started at 4:30 a.m. Sometimes fog grounded the ships for days. Really good spraying weather did not arrive until the day after the project was finished.

Nevertheless results were good. The test screens set out as counting slabs in the looper morgue indicated an average kill of 4,300,000 larvae per acre on one representative area. Thus, with 12,000 acres sprayed, the total mortality mounted into astronomical figures, or as one wag put it, "a looper for every salmon that has come up the Columbia River since Lewis and Clark came this way in 1805."

The 2500 pounds of DDT used were applied in experimental concentrations ranging from one-tenth of a pound to one pound per acre, with the chemical dissolved in from one to three gallons of fuel oil. It was spread on 2263 acres. (Continued on page 50)



PHOTOGRAPH COPYRIGHT JOHN G. SHEDD AQUARIUM, CHICAGO

When a paddlefish is cruising as shown here it swings its broad snout from side to side trying to detect the presence of tiny organisms in the water. The fish in the background are hickory shad, an associate of the paddlefish in native Mississippi River waters.

The Paddlefish Stumps the Experts

By MYRON GORDON

THE paddlefish is a big, easy-going, comical monster that looks like a cross between a sawbilled shark and a channel catfish. The scientists named it *Polyodon spathula.* The Mississippi fishermen call it paddlefish, spoonbill, shovelfish, duckbilled cat, or spade fish, depending upon the locality. When the commercial fisheries' agents sell it, they frequently pass it off as the shovelnosed sturgeon. Smart New Yorkers, when they buy it smoked, cannot tell the difference. Everybody seems to be happy about it except the United States fisheries' statisticians.

There are a lot of peculiar things about the paddlefish's life story that scientists and curious fishermen would like to know. Many of America's greatest field naturalists have been on the trail of the big fish for years, but even to this day, the place, the time and the method of its breeding and spawning habits are still unknown. Nobody has ever found the early developmental stages of its eggs; nobody has ever seen a newly hatched *Polyodon* larva. Every time someone catches a paddlefish less than ten inches in length it becomes a newsworthy item.

It is not that paddlefishes of average size are rare. Actually those weighing twelve pounds and about two feet long are commonplace. The records of about a dozen states drained by the waters of the Mississippi show that every year, since 1894, more than a million pounds of spoonbills are taken by commercial anglers. The fishes are taken by hoop nets, floating trammel nets, and huge seines pulled by barges equipped with power winches. In some years the catch has run as high as 2,473,250 pounds.

In spite of the many radical and injurious changes wrought by man in the Mississippi, the paddlefish has managed to maintain itself in these modern times, although it belongs to an ancient group of fishes most of which have long been extinct. Miraculously it has survived all the prehistoric geologic upheavals, as well as the recent land-water disturbances. Today *Polyodon* is the only one of its kind left in the western hemisphere. There is but one other living fish like it in the world and it inhabits the great rivers of China that flow into the Yellow Sea. The Asiatic paddlefish, *Psephurus gradius,* or the fighting pebble-tailed fish, lives in the Yangtze Kiang and the Hoang Ho, and looks much like the American species on the whole, but it has a much narrower paddle.

College professors of comparative anatomy, a generation ago, used to delight in lecturing on the structural details of *Polyodon.* They looked upon it as a sort of missing link in the evolutionary series be-

PHOTOGRAPH COPYRIGHT JOHN G. SHEDD AQUARIUM, CHICAGO

When feeding the paddlefish opens widely its huge mouth, which acts as a sort of plankton net to collect the tiny organisms that serve as food for the fish. Here they are daphnia, which appear as white specks in the picture.

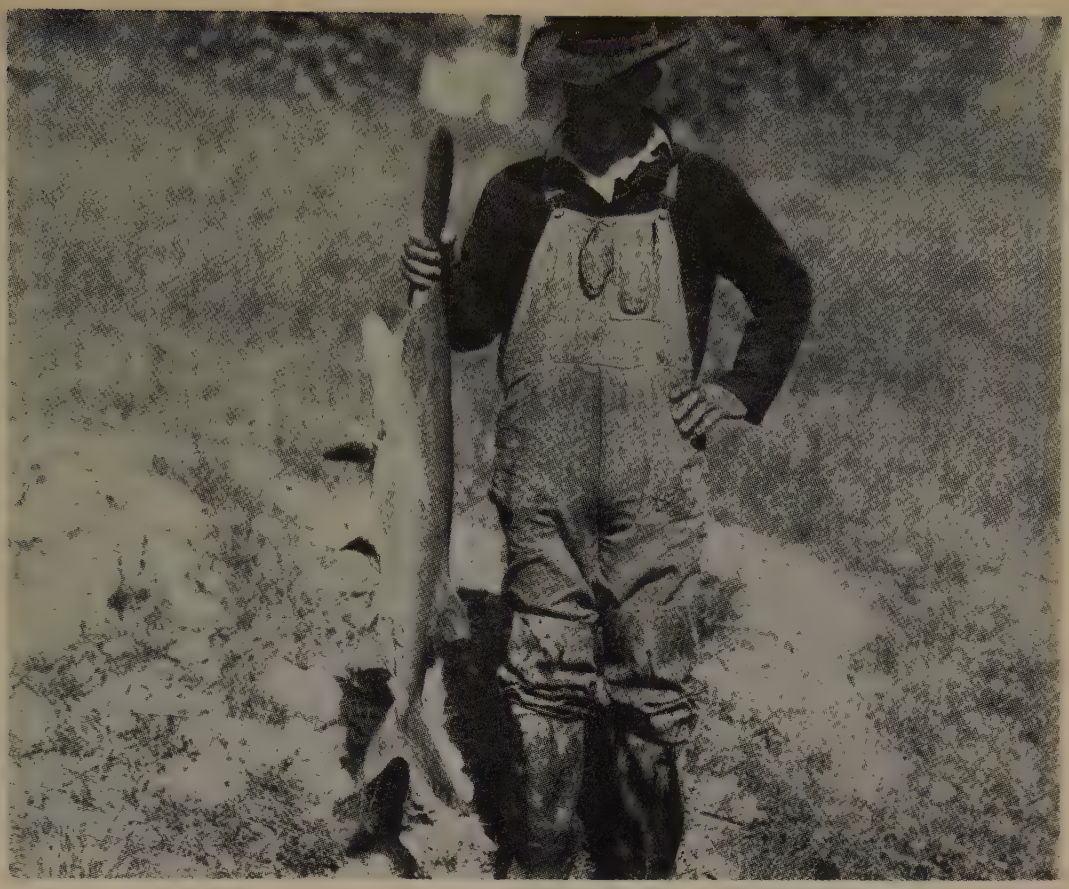
tween the sharks of ancient lineage and the highly specialized bony fishes of the present era. Actually there is a vast difference between the groups even though, like the shark, the paddlefish has a gristly, cartilaginous skeleton.

Time was when fish of the *Polyodon* type—known as ganoids—ruled all the waters. This was during the Palaeozoic times, the "Age of Fishes." Most of the ganoids of those days wore heavy, armor-plate-like scales, but as better models developed, these heavy-bodied fishes gave way to the faster and more aggressive kinds. Only eight genera of ganoid fishes have survived to the present day; living for the most part in fresh-water areas.

Curiously, *Polyodon* has the peculiar shark-like look. It should not be surprising then that when in 1792 the paddlefish was first made known to the scientific world, it was described as a shark. Johann Julius Walbaum, just a bit more than a hundred and fifty years ago, originally named it *Squalus spathula*, and the genus *Squalus* in those days meant *shark*. The specific name *spathula* obviously refers to the broad spatula or spoon-shaped snout.

The zoological position of the spoonbill was still confused in 1820, for in that year Constantine Samuel Rafinesque, a professor in Transylvania College, wrote a book on the fishes of the Ohio River based upon his own explorations and observations, and he insisted that there were not just one but three, shark-like fishes in the Ohio. Later-day ichthyologists agreed that Rafinesque's powers of imagination were greater than his accuracy. *Polyodon spathula* remains the single representative of its kind in the New World. The sturgeons are its nearest living kin. Just beyond the sturgeons are the bowfins and garpikes. After all those, come the more familiar bony or teleost fishes like trout, minnows and perches.

In the early days, before the Mississippi Valley was radically changed by hydroelectric plants and by industrial enterprises, huge paddlefish six feet long, weighing more than 150 pounds and measuring four feet in girth, were common. Today the run of the stream type weighs about fifteen pounds. They have a wandering disposition and travel to all sections of the enormous Mississippi River system. They are powerful swimmers, and are often found in midstream where the current runs the fastest. They are sought in the larger bodies of water of southern bayous, lowland streams and river channels. In the spring, they apparently migrate to head-water tributaries and interconnecting water areas. Charles R. Stockard, late professor of anatomy in the Cornell University School of Medicine, got an early start in his biological career when, as a student in 1907, he followed the spring migration of the paddlefish in the waters of his native state of Mississippi. He discovered that the spoonbill, in springtime, when the waters of the Mississippi River rise and overflow into the Louisiana bayous, follow the newly established water highways into the inland lakes. He found that those watery trails are often obstructed by intertwined trees and shrubs. The fish have tough going,



PHOTOGRAPH BY DR. A. D. HOWARD

This photograph of a paddlefish about four feet long appeared in the bulletin "Studies of Common Fishes of the Mississippi River at Keokuk", by Robert E. Coker. In earlier days much larger specimens were commonly found.

but in spite of all difficulties they reach their destination, although they may be emaciated and scarred.

Later in the season, Stockard watched them return to the main channel of the big river just before the gradually falling water level isolates the bayou water areas. Some biologists believe that this spring migration upstream and into bayous is associated with their breeding cycle. Many small *Polyodon* are taken far above dammed areas in mid-summer, probably those hatched from eggs laid earlier that spring. Yet when a systematic attempt to check the condition of the generative organs of 1500 spoonbills in Lake Pepin between Minnesota and Wisconsin was made from June to September by George Wagner, the fisheries expert found none of them appeared to be ripe for spawning nor had their reproductive organs been spent. Dr. Paul Bartsch, now of the National Museum at Washington, who in 1875 to 1896 lived in Burlington, Iowa, reported that in those days paddlefish in great numbers entered sloughs on the Illinois side of the rivers in springtime. Upon dissecting the fish, he discovered that they contained roe in an advanced state of development.

No important break in the *Polyodon* mystery occurred until 1933, when David H. Thompson, then working for the Illinois Natural History Survey, discovered, with the help of two assistants, a group of tiny paddlefish only about five-eighths of an inch long, 17 millimeters to be exact—the smallest of their kind ever found. They were a curious looking lot. At that age, there is little sign of the paddles. The heads are oversized in proportion to their bodies and they seem to be all mouth except for hood-like coverings protecting their delicate gills. Two tiny, stubby, whisker-like barbels project from their upper lip, giving them a comical clown-like appearance.

Thompson, together with Charles N. Planthaber and Carl O. Mohr, on the morning of May 14, 1932, hauled their twenty-foot minnow seine through a section of the Mississippi River at a point two miles below the town of Grand Tower. They were at first keenly disappointed at their meager catch. But they noticed a number of tiny pale and translucent organisms, so small that many of them fell through the one-sixth inch mesh of the seine. They tried to keep some of them alive, but after a few feeble efforts at swimming the tiny fish, which were first thought to be the young of the sturgeon, died and were preserved in alcohol, labelled with respect to time and place of capture and put aside. It was only later, in the laboratory, that their real identity was discovered.

Looking back, Thompson suggests some of the reasons why it has taken more than a century to secure a dozen small representatives of this conspicuous and common Mississippi River fish. He thinks the parent spoonbills spawn, and the larvae grow up, in the swift and turbid portions of the main channel of the river —a region that is biologically the least known. The paddlefish migrate through large rivers and bottomland lakes, all of which are, for the most part, inaccessible to properly-equipped collectors. Furthermore, it is likely that the *Polyodon* eggs hatch

quickly and the larvae grow rapidly, so that the collector has to be on the right spot at the right time.

America's greatest ichthyologist, the late David Starr Jordan, said that, more than half a century ago, the meat of the paddlefish was little esteemed, less desirable than that of the Mississippi channel catfish, and was eaten only by the poorer Negroes of the deep South. In recent years, with the falling off of the sturgeon catches, processors have discovered that paddlefish meat when smoked resembles that of sturgeon in texture and delicacy of flavor. Thousands of pounds are sold in large eastern cities to people who pay over a dollar a pound for it.

Robert E. Coker, a U. S. Bureau of Fisheries expert, claims that the paddlefish today is, pound for pound, one of the most valuable fishes in the Mississippi Valley and has added greatly, he says, to the income and well-being of commercial fishermen of the region. In recent years, owing to man's encroachment on the paddlefish's aquatic domain by the construction of obstructive dams and hazardous turbines at hydroelectric plants, and particularly by the chemical pollution of the river waters by industrial wastes, the big fishes have given up some of their former territory and retreated to other regions where they have subsequently increased in number. In Tennessee, Illinois, Missouri and Kentucky, the commercial spoonbill fisheries have fallen off as much as seventy percent, but, fortunately, there has been a corresponding increase in the waters of Arkansas, Louisana and Iowa. The catch in northern Alabama, in the T.V.A. reservoirs, during 1943, totaled nearly a million pounds, bringing close to $200,000 to the pocketbooks of the local fishermen, and these figures do not include the thousands of fish that were caught and eaten by the natives. In addition to the value of its meat, the paddlefish provides a grade of roe or fish eggs that, like those of the sturgeon, is of fine quality and is processed into caviar. When the usual imports of caviar from Russia and the Baltic states were cut off during the war, paddlefish caviar filled the bill of fare for many American gourmets who relish that rare and tasty dish. Since the roe of a large paddlefish may weigh ten to fifteen pounds and will bring more than two dollars a pound, a single roe-carrying fish may represent a very lucrative catch indeed.

According to fishermen, the big shovelfish lives on the slime and mud of the rich Mississippi River bottom, an idea they insist is confirmed by the appearance in plain sight of the contents of the fish's alimentary canal which is commonly filled with a dark brownish, semi-fluid mass resembling mud.

When the dean of Illinois fisheries students, Stephen A. Forbes, placed some of the so-called *mud and slime* from a freshly-opened Polyodon's "innards" under a microscope, he found "countless myriads of Entomostraca [shrimps, water-fleas, copepods] of nearly every form known to occur in the Mississippi. Mixed with these in varying proportions, often, indeed, predominating, are soft-bodied aquatic insects, chiefly those of day-flies, dragonflies and gnats (*Chironomus*), and a smaller percentage of adult aquatic insects, amphipod crustaceans, leeches and water-worms (*Naidae*), to which are added, in some cases, considerable quantities of aquatic vegetation, largely algae, including fragments of various aquatic plants." Like all wild creatures, *Polyodon* will take what happens to be most plentiful in season. At times it makes a meal on mayfly larvae exclusively and on many occasions it apparently finds the tiny daphnia completely to its satisfaction. *Polyodon* relishes a meal of green tidbits, frequently feeding on the microscopic plant of the genus *Nostoc*, which grows embedded in a jelly-like clump and is moved about by water currents like most items of plankton. Forbes' startling discovery that the huge paddlefish eats nothing but minute items has been confirmed by other scientists. In swimming, the fish holds its mouth wide open, without the rhythmical respiratory movements common in most fishes, although it occasionally closes it energetically, perhaps to swallow its harvest. The tiny food items forming the plankton mass are strained from the water by its gill rakers. These long, fine, comb-like structures are located far back in its throat. The fish's immense mouth, acting like a collecting net, engulfs large quantities of water, and with it, thousands of swimming and buoyant living organisms. The water is first forced through the remarkable straining apparatus, the gill rakers, and then it passes out again through the fish's gill-slits. The filtering process goes on continually. *Polyodon* quickly detects the presence of plankton food and will circle repeatedly over the same path as if to entrap the last tiny living organism suspended in the water.

Walter H. Chute, Director of the John G. Shedd Aquarium on Chicago's lake front, holds the world's record for the length of time he has kept a paddlefish alive and happy in (Continued on page 52)

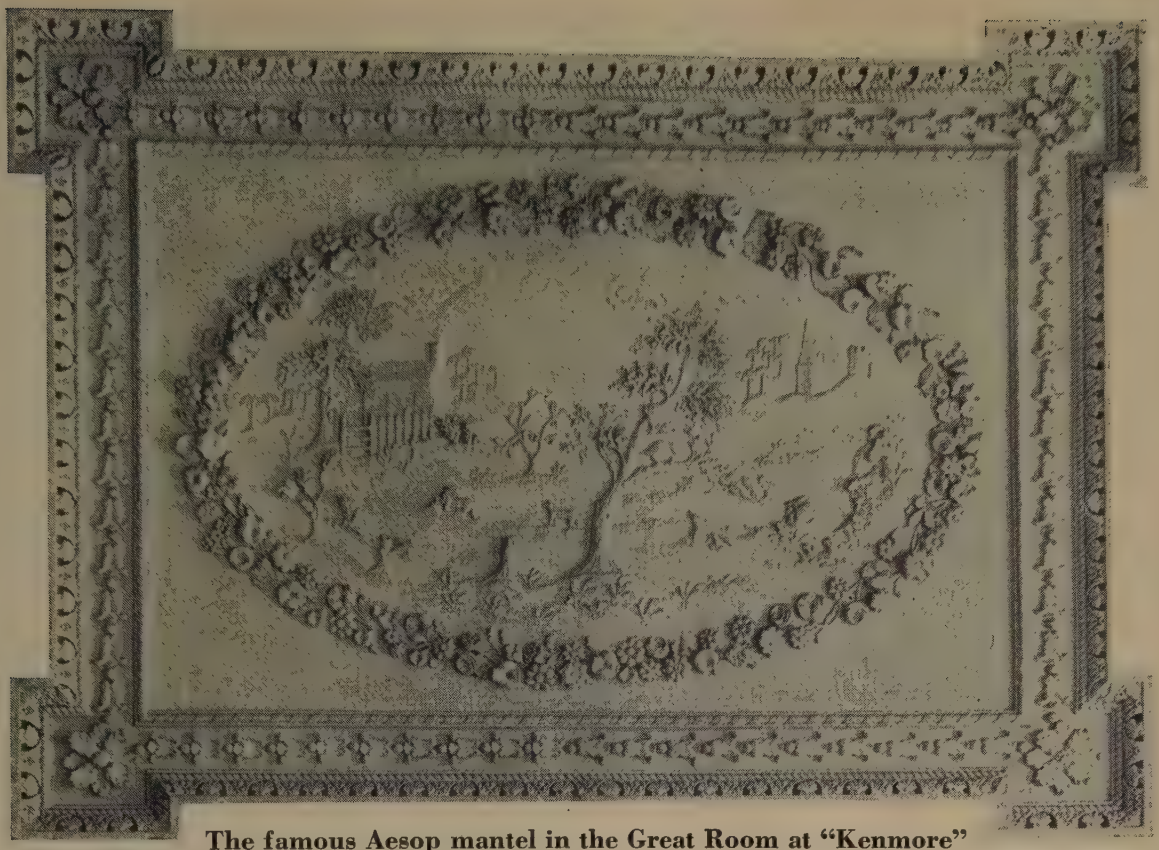
Mid-Ocean

By M. CLIFFORD HARRISON

The sea is a basin of bluing
For garments of titans and gods;
Some giantess washwoman splashes
The suds as with vigor she prods.

And then on the sky's unseen clotheslines
She hangs out the garments to dry:
White linens and flannels and fleeces
That ripple and flutter on high.

At last, when the sunbeams are hottest,
The giantess wind-maids begin
To make their quick rounds of the clotheslines
And gather the garments all in.

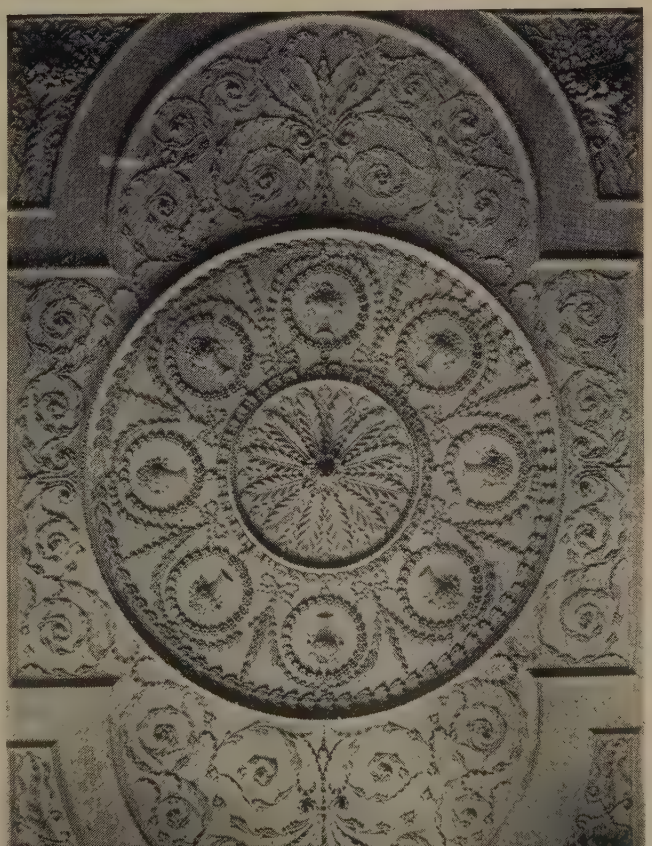


The famous Aesop mantel in the Great Room at "Kenmore" was designed by George Washington as a gentle warning to his nieces and nephews. Below, detail of the "four horns of plenty" ceiling in the same room.

Nature in "Kenmore's" Decoration

By MAUD MACDONALD HUTCHESON

PERHAPS the symbolism of flowers and fruits had a special appeal for George Washington. He approved, and may even have selected them, as the decorative motif of the ceilings at "Kenmore," his sister's stately colonial home in Fredericksburg, Virginia. It was built in 1752 by Colonel Fielding Lewis for his young wife, Betty Washington. Brother George was a favorite visitor at "Kenmore." It was always a second home to him, and his influence in its planning is clearly traced. The ceilings, which are richly ornamented in stucco, have been compared, for magnificence, with those in the Palace at Versailles, which are the handiwork of the same "Frenchman" who decorated the Mount Vernon ceilings.



A majestic circle, embraced by four semicircles, forms the ceiling of the Library at "Kenmore." Graceful loops and swirls of intertwining flowers ornament each of these enclosures. But the designs in the four corners attract special notice. These typify the four seasons — softly-fronded palms for spring, bunches of grapes for summer, delicately-fashioned acorns for fall and mistletoe for winter.

The ceiling of the Library at "Kenmore" displays the flower motif, with designs in the four corners typifying the four seasons.

The fruit-and-flower overmantel in this friendly room is of equally fine workmanship. It is a picture in plaster, and a most effective decoration. In the center of a handsome stucco "frame" is a slender basket, below which a garland of flowers is artistically looped.

In the Great Room, or Salon, the ceiling is dominated by an immense circle, adjoined by semi-circles at either end. Within the large central circle are eight smaller rings of conventional flowers, each woven around a basket of blossoms. The four corner spaces again compose an important decorative theme. Flowers and fruits spill out in abundance from a cornucopia in each, so that this is known as "the four horns of plenty" ceiling. Delicate loops and scrolls intertwine over the whole.

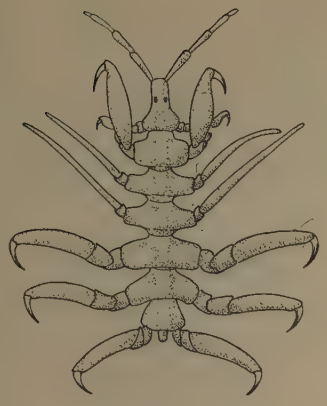
It is in the Great Room that the famous Aesop mantel is to be seen. This was designed especially by Uncle George as a gentle warning to his eleven Lewis nieces and nephews to eschew vanity and flattery. The central theme of this allegorical mantel is the story of the fox, the crow, and the piece of cheese—daintily told by plaster figures. A tiny house, church and fort, symbolize the strongholds of the nation. Other significant figures are the proud, boastful swan, stripped of her feathers by her companions; the lamb that muddied the water for itself, in stirring up trouble for another; the lion set free by the mouse. This collection of fables is set in an ellipse of flowers—a garland of roses, daisies and morning glories—with a handsome square frame forming an additional enclosure.

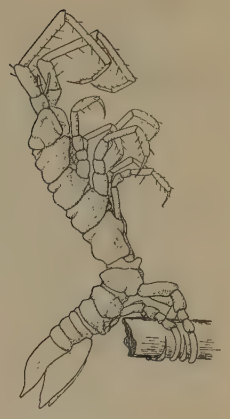
The Dining Room ceiling differs from the others in being a series of smaller circlets, in each of which a single blossom holds pride of place. All this elaborate decoration radiates from a head of Louis XIV, set in rays to betoken the Sun God of France. The cornice of the room is embellished with seven motifs, including the egg and dart, familiar as the emblem on the Washington state coach.

Even the stairs leading to the bedrooms at "Kenmore" have their place in the scheme of symbolism. At the end of each tread is carved a dainty lotus flower, whose meaning is soft sleep.

Since stucco work was rare in colonial houses, "Kenmore" ceilings are of interest on that score and doubly so for Washington's share in their design. When Fielding Lewis bought the 860-acre property for his house he had the survey made by George Washington, "Public Surveyor." When the mansion was building the two brothers-in-law discussed fine points of architecture and interior adornment.

At "Kenmore"—or "Millbrook," as it was known in the Washingtons' day—Mistress Lewis dispensed lavish hospitality to her devoted brother and many famous colleagues. The stately old mansion knew George Washington as a soldier of several wars, as a young officer of the Virginia Militia, as Braddock's aide in the Ohio campaign, as defender of the Colony's wide frontier, as Commander-in-Chief of a Continental Army. It was to "Kenmore" that Washington spurred his horse after (Continued on page 50)





At the left, a whale louse from a humpback whale. The drawing is about twice natural size. Above, a common caprellid from the California coast. This is a male. The little paddle-like objects are its breathing organs. Three times natural size. At the right, Arcturus, a rare and little known relative of the Caprellidae. This one was found on the leg of a sea spider dredged from 1374 fathoms. Gills are under the tail. Four times natural size.

Praying Mantids of the Sea

By JOEL W. HEDGPETH

AMONG the fern-like seaweeds and feathery hydroids of the tide pools and on the mud of estuaries lives a queer little animal that spends its days in pious gesticulations, and raises its young in a brood pouch on its belly like a kangaroo. This is the caprellid, or skeleton shrimp. Much has been written about the amusing antics of hermit crabs, yet the caprellids are none the less fascinating to watch in spite of their smaller size. A branch of hydroids with its gathering of skeleton shrimps is a sideshow in miniature as the inch-long performers jerk back and forth with their sickle-shaped claws, raking the water for luckless passersby.

The caprellid hunches over its big front claws in a prayerful attitude somewhat reminiscent of that ferocious monster of the insect world, the praying mantis. Like the mantis, the caprellid pounces on its prey as it comes within range. In the case of the skeleton shrimp, however, the prey are the myriad animalcules of the sea. It also feeds on diatoms, which it scrapes from its own body, and, rarely, on the hydroids that give it shelter and mooring place. The little crustacean moves from place to place with the humping progress of a measuring worm, grabbing on with its front claws as it disentangles its three pairs of finger-like hind legs from their mooring and moves them forward.

A female caprellid, showing the brood pouch in which the young are hatched. Three times natural size.

The skeleton shrimps, whose full-dress name is Caprellidae, belong to the crustacean order Amphipoda, which includes the familiar sand fleas, the marine and fresh water gammarids and some odd creatures from the deeps. Some of these other Amphipods, like *Arcturus*, look more like the typical caprellid than its nearest relative, the whale louse. The typical caprellid is little more than an animated bundle of slender, pipe-like body segments and twig-like appendages, often fantastically elongated. But the whale louse is flattened out from top to bottom instead of stretched out from head to toe as is the caprellid. In both, the abdomen is reduced to a mere tubercle.

The whale lice, or cyamids, have essentially the same pairs of legs, claws and breathing appendages as the stay-at-home caprellids, but their appearance is startingly different. They look so much like the common European sea spider that early naturalists classified both the sea spider, *Pycnogonum*, and the whale louse, in the same genus. This confusion gave rise to a misconception that the sea spider was parasitic on whales. Although the whale louse is nearly an inch long, it is probably of no importance to the whale. When removed from its huge host, it digs its sharp claws into the collector's fingers, so strong is its instinct to hang on for dear life.

Zoologists who devote their lives to classifying animals have paid little attention to the caprellids, although they are among the most common inhabitants of tidepools and sheltered parts of the shore. This is partly because of the difficulty of identifying these animals except during their breeding season. The problem of identification is increased by the wide differences between the young forms and the full-grown animals, as well as the differences between the sexes of the same species. Although the classification of these little creatures is in a chaotic state, about 150 species have been recognized by various specialists.

The young caprellids are raised in a brood pouch formed from ventral folds of certain body segments of the mother. When the baby skeleton shrimp is old enough to shift for itself, it struggles out of the

pouch. But it does not go very far from home, clinging to the nearest foothold, or to some part of its parent. Some mothers help their young out of the brood pouch and place them on their antennae. After the third molt the young caprellids begin to leave home. This is only the beginning of the skeleton shrimp's progress through life, however, for it passes through no less than sixteen molts, or instars, before maturity. The molting occurs at night.

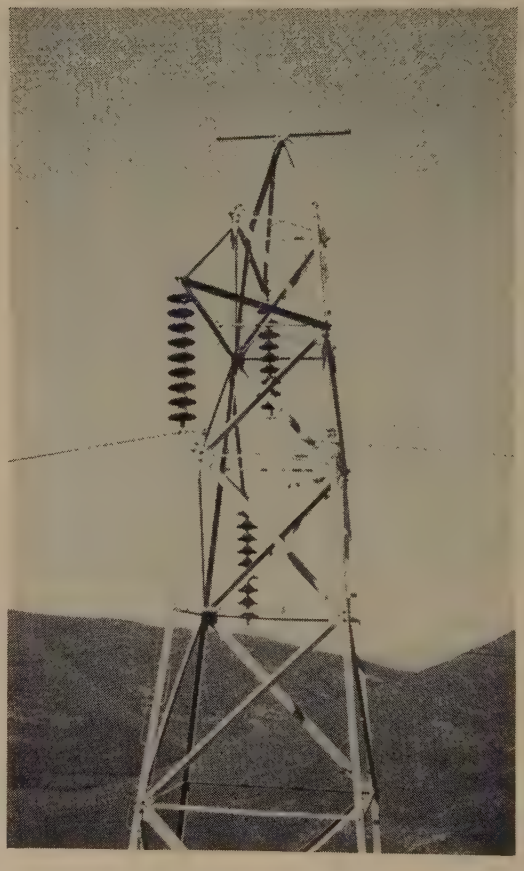
Because of its conspicuous heart and large cells, the caprellid can be observed with a medium-powered microscope, and is an admirable subject for home investigations. Amateur naturalists could make a real contribution to the intricate problem of taxonomy by carefully observing the various life stages of the Caprellidae. None of our common American forms are well known, and it will not be until every one of the sixteen instars is carefully drawn and measured that species of these animals can be confidently determined. Nor is the entire life of the skeleton shrimps known—they have yet to be successfully raised in captivity beyond the third molt, and details of their private lives are unknown.

Even less is known of the related whale louse, which is not surprising since there are a lot of things we still do not know about the whales themselves. Jonah, who might have had the opportunity to learn something about the subject, was evidently uninterested. The little mantids of the tidepools are accessible to all who live near the ocean, however, and watching their droll antics will shorten many hours with profit to both observer and, perhaps, to science.

Reducing Bird Electrocution

By G. V. WILLETS

MANY years ago an American eagle sailed gracefully through the azure blue of California skies, his keen eyes scanning the earth below in search of food. There were few trees in which a bird could perch in this particular hunting ground, so he hunted on the wing. Having located a small animal he would swoop down, snatch the luckless creature in his claws and fly away.



In time electric transmission lines were built to carry power to coastal cities from huge hydro-electric plants in the High Sierra. Towering steel structures were built to hold these electrically charged ribbons of copper in place. Far above them an eagle would swoop down to perch on the tower, from which vantage point he would continue to scan the landscape in search of hares or other small animals. Landing on the tower was of itself a dangerous matter, but taking off was often fatal to the eagle . . . and the power company. As the great bird spread his wings, their tips would sometimes come in contact with *two* wires. There would be an instantaneous flash and a moment later the eagle's smouldering carcass would hang amidst the wires, or fall in a shower of feathers, sparks and smoke to the earth. Miles away lights would flicker and go out.

To meet this situation power companies commenced installing special perches atop transmission poles in the hope that birds would use them and keep away from death-dealing wires. This was an excellent idea except for the fact that larger birds like eagles, pelicans and hawks found it difficult to hold on with their feet to the ten-foot, three-quarter inch steel pipe that had been provided. They shunned the perches and continued to alight on the framework of poles. Short circuits continued, birds were electrocuted and electric service was continually being interrupted.

This problem has now been solved by a northern California power company, which has replaced the metal perches on their poles with wooden rods *two inches in diameter* and mounted on the topmost peak of each giant pole. Large birds have revealed a preference for these wooden perches, electrocutions have about ceased, and power service continues without interruption.

The photograph shows a pole on the Pacific Gas & Electric Company's power transmission line between Tracy and Livermore in California. In this district there are no trees or high places where an eagle or other large bird might alight. The wooden perch is placed sufficiently high above the wires to give a large bird ample opportunity to spread its wings and take flight before it drops far enough to touch the power lines. Thus another step has been taken that will help to preserve eagles and other birds from this one of the many hazards of civilization that threaten our avian life.

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

Celestial Events of 1946

By ISABEL M. LEWIS

DURING the year 1946 solar activity will increase, although the sunspot maximum period is still several years away. In addition to more spots appearing upon the face of the sun, there will be more eruptive prominences, more auroral displays, and, undoubtedly, more magnetic storms associated with the appearance of certain groups of sunspots, or some other form of solar disturbance that affects the ionosphere.

The solar corona observed during the total eclipse of July 9, 1945, belonged to the sunspot minimum type of corona, and this should change to the so-called intermediate type with equatorial streamers not as long as in the sunspot minimum corona, or polar rays as sharply curved at the extremities of the magnetic axis of the sun. There will be no opportunity, however, in 1946, to observe the solar corona during the total phase of an eclipse for there will be no total solar eclipse to lure the astronomical observer.

In 1946 there will be six eclipses, which is one less than the maximum number that can occur in one year. Four of these will be partial eclipses of the sun; two, total eclipses of the moon. On January 3 there will be a partial solar eclipse of which the greatest magnitude will be 55 per cent. This is the part of the sun's diameter covered by the moon at the place on the earth where the eclipse is greatest. There is only one place on the earth where the sun will be eclipsed to this extent—in the Antarctic regions southeast of New Zealand. The eclipse will be visible in the South Pacific and the southern part of South America.

On May 30 there will be another partial eclipse of the sun. This will attain a magnitude of 89 per cent at a place in the South Pacific Ocean to the southwest of South America. With the exception of a few

islands in the South Pacific this eclipse will touch no land, except Chile and part of Patagonia at, or near, sunset.

On June 14 there will be a large total eclipse of the moon, the total phase of which will last more than one and a half hours and will be visible from all parts of the earth where the moon is above the horizon at the time of its occurrence. The beginning will be visible in the Antarctic regions, New Zealand, Australia and the central and western part of the Pacific Ocean and most of Asia, the Indian Ocean, southeastern Europe and southern and eastern Africa. The ending will be visible in Antarctica, Australia, most of Asia, the Indian Ocean, Europe, Africa, the south Atlantic Ocean and extreme eastern part of South America.

On June 28 there will occur another partial eclipse of the sun with a magnitude of greatest eclipse of only 18 per cent. The maximum eclipse will occur at a place on the west coast of Greenland nearly on the Arctic Circle. This extremely small eclipse will be visible only in the Arctic regions and the extreme northern part of North America.

On November 23 there will be another partial solar eclipse with greatest magnitude of the eclipse visible at a place in southern Greenland, where 78 hundredths of the sun's diameter will be covered by the moon at time of greatest eclipse. This eclipse will be visible in all parts of the United States except the extreme western and southwestern part of the country. It will also be visible in most of Canada, and the central and western part of the North Atlantic Ocean. The southern limit of the eclipse passes through part of Central America and the northern part of South America.

On December 8 there will be a total eclipse of the moon, the total phase of which will last 58 minutes. The beginning of this eclipse will be visible in the northwestern part of North America and the northern and western part of the Pacific, New Zealand, Australia, Asia, Europe, and eastern Africa; the ending will be visible in the Arctic Ocean, the western Pacific, Australia, except the southeastern part, Asia, Europe, and Africa, and the eastern part of the Atlantic Ocean.

There will be three eastern elongations of the planet Mercury this year—on March 9, July 5, and October 31. The planet will be seen in the western evening sky for a week or more before and after these dates, and for an hour or so after sunset. There will also be three western elongations occurring on April 23, August 20 and December 9, when the planet will be farthest west of the sun and visible in the morning twilight for a week or more before and after these dates, and for an hour or so before sunrise. The best time to view the planet in the evening sky is in the spring at the date of elongation nearest to the vernal equinox, which will be, this year, the elongation of March 9. The best time to view the planet in the morning sky will be at the western elongation nearest to the time of the autumnal equinox which this year will be the elongation of August 20.

The planet Venus starts the year poorly placed for observation as it is approaching superior conjunction with the sun, which will occur on February 1; it is very low in the southeast at sunrise in January. It will pass from west to east of the sun on February 1, when it has the same phase as the full moon. It is next visible after sunset in the western sky, where it will remain until November 17. Then it will be in inferior conjunction with the sun and will pass to the west of the sun again and become visible in the east before sunrise. Venus will increase its distance from the sun in the evening sky during late winter and spring and through the summer, but will not reach its greatest distance east of the sun until September 8. It will then draw in toward the sun once more. It will be at its greatest brilliance on October 13, and again on December 23, after it has passed inferior conjunction and is in the morning sky.

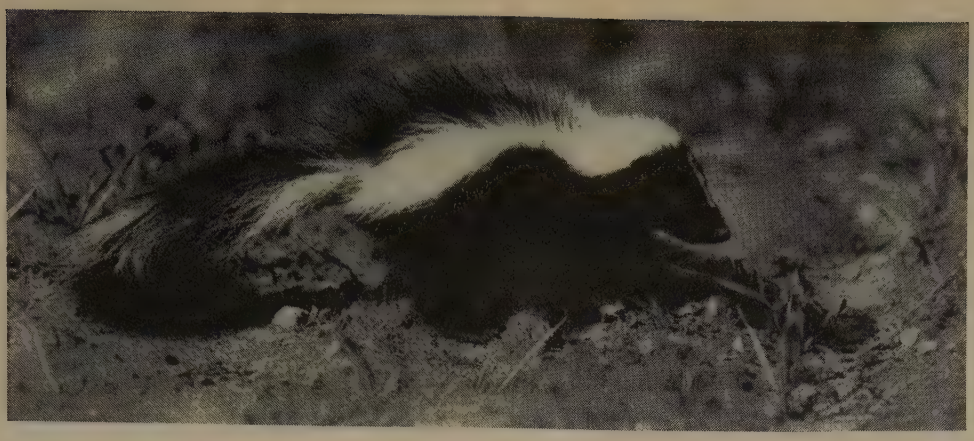
Mars rises in the early evening at the beginning of the year and is in opposition to the sun on January 13, when it will be brighter than Canopus but less brilliant than Sirius. This is not a favorable opposition of Mars, and the planet will be nearly 60 million miles from the earth at that time. At date of opposition Mars will be visible throughout the night, and will remain visible in the evening sky for the remainder of the year. It is in Gemini in January, close to Saturn, and passes about four and a half degrees north of it at time of conjunction with it on January 22. It is again in conjunction with Saturn on March 18 when it is 3 degrees north of it. On August 9, and again on November 6, it is in conjunction with Venus, and with Jupiter on September 24. It is in conjunction with Mercury on October 20, and again on November 14, as it draws in toward the sun.

Jupiter will be in Virgo a few degrees northeast of Spica on January 1, passing into Libra the end of October. It will be found there for the remainder of the year. On January 16 it will be on the meridian at sunrise. It will be in opposition to the sun on April 12, and will then be visible throughout the night. On October 31 it is in conjunction with the sun, and from then on to the end of the year will be found in the morning sky. Jupiter will be in conjunction with Venus on September 3, with (Continued on page 51)

On New Year's Resolution

By CARSTEN AHRENS

Cogitate a moment
His stupendous consternation,
Should the chap with star-hitched wagon
Really reach his destination!



Skunk Sense

By TOM WALLACE

PERHAPS the most misunderstood and mistreated of all of our beneficial wild animals is the unobtrusive skunk, a furbearer subject to legitimate killing or capture for its pelt, but useful to agriculture and arboriculture; rarely injurious to poultry.

For nearly two years I exposed a small flock of hens to any prowling predator by leaving the door of the hen house wide open every night. My purpose was to test a family of skunks that lived under the floor of the building and kept it mouse-and-rat-free.

I lost no eggs—of course skunks do not tackle adult poultry—and I was distressed when a man on the farm, seeing one of the skunks in the hen house in daytime, killed it. The others departed. The mice returned and I have never been rid of them since that time. When, occasionally, rats appear I poison them, but mice, unlike rats, have little sense, and poisoning a few occasionally does not drive others away.

Often I have met a skunk coming out of the hen house, and I have done the courteous stepping-aside, the skunk moving along unconcernedly. I have also met several in cowpaths in meadows, always giving them right of way.

One day, in a dense little woodland, my wife and I encountered a mother skunk with a considerable group of babies just old enough to go grub hunting. The mother seemed a little concerned, but merely walked a bit faster than usual, followed by her young. A few days later I was told of a remarkable occurrence. A skunk had snarled at a pedestrian on the public road. I went down to get snarled at, if possible, because I could not believe the tale. But there was the skunk. She snarled at me. I took time to find the cause. One of her babies had been killed by an automobile and she was standing her ground near the tiny corpse, a puff-ball of black and white knocked from the paved surface into the grass by the roadside.

Once, at the roots of a hollow tree, our dogs dug out, but did not injure, some young skunks so small that they were hairless and not easily recognizable. After identifying them, and finding that the mother was in the hollow tree, I put them on an ordinary dirt shovel—not a long-handled one—and handed them to her. She took each from the shovel and put it in the hollow. I shut the dogs up for the night, and, by morning, the skunk had found a new home for her family and had carried them there.

Foresters know that skunks destroy grubs that destroy oaks. Farmers—I mean the average farmer—does not learn much about wild animals. He assumes that all of them are after his chickens, and lets it go at that. He also lets go his shotgun at anything with fur. He is wrong about the skunk.

Of course a skunk sometimes will take a baby chick if the hen is out of doors at night. However, nobody gets profit from poultry if he lets hens with young chickens stay out at night to hover their young.

One night I was awakened by a tremendous squawking, and, with a lantern, went to the scene. A hen, which had nested outside, and hatched her eggs, was hovering her brood by the side of a fence, and a black skunk with a white fork on its back and a white tail was reaching under her with one paw trying to get a downy chick. I put the lantern over the fence and the skunk departed. I went back to bed. In a little while the uproar began again. I returned and witnessed the same performance. The skunk had not succeeded in getting his midnight supper, but was industriously trying.

I hung the lantern over the fence by one of my shoestrings and left it there. The skunk did not like the light and the hen did not mind it. Next morning we captured the hen and her babies and put them where they would be safe at night; safe from rats and from weasels, which, unlike a skunk, do not kill one chick and eat it, but may kill a dozen at one time, either to drink their blood from their cut throats or for the sport of killing. Some students of wildlife say no wild animals kill for sport. That may be true. The rat and the weasel may intend to hoard food, or may specialize in blood as a diet. I do not know. I am only a newspaper man—and a farmer.

The School Page

Edited by E. LAURENCE PALMER

Professor of Rural Education, Cornell University,
and Director of Nature Education, The American
Nature Association

WAR MEMORIALS

In journals representing the interests of groups to which I belong, in letters from friends in military service in Europe and in Asia, as a representative of local groups in community councils, I have heard the subject of war memorials presented from a maddening variety of viewpoints. I have heard soldiers rise in meetings and plead for monuments on which their names might be inscribed. I have heard directors of physical education—who did not themselves go to war but who are mindful of their future jobs—clamor for bigger and better swimming pools and gymnasiums than the home community could support. (This was not in my home town.) I have heard dreamers plead for huge auditoriums where there are already more than are used. And I have heard canny business men shy off from any project likely to cause them to dig deeply into pockets well filled by war contracts. I have heard people seeking living memorials for the dead, and dead memorials for the living; selfish communities asking the unselfish support of weaker, neighboring communities for projects in which the neighbors could not share the benefits as they would share the cost. I have seen public-spirited citizens, who sought membership on memorial committees before V-day, resign from such committees a few days after. I have even proposed, myself, what I think might be an appropriate living memorial, and been more than surprised to see the suggestions win at least some slight support. The fact that I have, in a small way, established a similar memorial for a private loss need be taken only as evidence of my sincerity, and that I have convictions as to its appropriateness.

What is a memorial, anyway? When I was a youngster, it was a cast iron statue atop a granite column, or a day of rather solemn reflection on things well done. Today, Memorial Day has degenerated into more or less of a spree. Certainly it is not a day on which sober reflection, or sober behavior, is in order. Consequently, in our family, we observe our own private memorial day in our own way. Today my friends are talking of huge buildings as memorials to accomplishments of huge armies and navies. Somehow I cannot enthuse over their ideas. I am sure some of them cannot enthuse over mine.

To me a memorial should take the form of a dedication of effort to something fine. It should seek to preserve ideals and make the world a better place in which to live. It should be personal, constant, significant, local, cooperative, and definitely commemorative. It should not be something that the community was likely to have anyway, nor should it deprive individuals of the satisfaction that goes with the development of worthy projects on the basis of the merit of the projects themselves. No private interest should try to attain its goal by shifting its responsibility to the opportunity of the moment to capitalize on recognition of the service of our armed forces.

A memorial should call upon generosity, but it should never be or become a burden. It should enlist pride and community effort, not alone during the period of a drive but for a long time after. It should need no campaign of a revival nature for its success. It should bring out and preserve the best in individuals and in communities. It should stimulate reflection and not forgetfulness. It should be restful, not exhausting; quiet, not blatant.

Does any one stand up and cheer when he loses a good friend? Then why should we erect huge cheering stands to commemorate the loss of many friends? Gratefulness is dignified and reasonably sobering, not something expressed and stimulated by the athletic skill of a squad of cheer leaders. There is not the slightest intent behind these comments to defend chronic sorrow. In fact, there is not the slightest desire to defend anything. Rather, I merely wish to present my idea of what, to me, seems a more fitting memorial than most that I have heard proposed.

True, I will make a token financial contribution to any project a representative committee of my community may make, but I am afraid I will make my real offertory by myself somewhere else. I have little faith that my wishes will carry weight with the campaigners, the chronic "whooperuppers" for the old home town. Neither have I any fear that their concrete swimming pools and alabaster towers will satisfy my urge to dedicate a part of my life to making things better, as I see them, for the community some of my friends will never again see, but about which they wrote me for years before they fell in battle.

Fortunately for my bank account and for my conscience, I can make the orthodox contribution to the standard project that will probably be selected, and still have something to advance the idea that offers much greater appeal to me.

It happens that I live in a community of which Louis Agassiz once said that he had never before seen a valley that offered so great an opportunity for knowing Nature. I doubt if he would say that today. I am reasonably confident that, as the years go by, such a statement will be progressively less appropriate. I have beside me a letter from a student who, for three long years, wrote me regularly of his post-war plans, and of his hope that he could return and roam with me up a certain beautiful little gorge in which there is not even a landscaped pathway. This gorge still has its pristine worth. It is a gem that no human architect can ever hope to duplicate. The writer of the letter will never come back from Okinawa. This afternoon, a captain, just returned from years of service in the tropics, noticed in a log that I have kept that he, the Okinawa boy, and I had taken a memorable trip, just six years ago to the day, to the place where we happened to be. We were quiet in this memory, and down in myself I said that somehow I was going to do everything I could to make that place mean to others what it had meant to the three of us.

I do not think I am sentimental about this; I am just realistic. Certainly I am not maudlin. But what can I do about it, and what would I do if greater support than I myself can give were forthcoming? Well, here is my suggestion.

I do not take Agassiz's comment about Ithaca, New York, too seriously. While I like it, I am sure that any place has plenty of beauty spots worth preserving if we only have the imagination to see them. I am confident that there is not a community in the country that does not boast plenty of spots worth preserving. It may have been nothing more than a good trout hole, an excellent bit of grouse cover, a clean *natural* swimming hole, a high observation point over a valley, or just a quiet spot that Nature may have spent hundreds of years in developing. These fine things that all of us away from home miss are worthy of our efforts to preserve. If we cannot save them for any other reason, we may well set them aside in commemoration of the lives or efforts of those who made sacrifices for their preservation.

I wish that any community, whether it is a village, city, county or state, would dedicate at least a *part* of the effort of a

memorial drive to the preservation of the finer natural areas within its boundaries. Simple, distinctive markers, or uniform styles of structures for any necessary simple buildings, could be agreed upon. These in themselves would serve to reiterate the memorial convictions of the people of the area. I would see no harm in simple shelters being established, provided wholesome recreation could be attained without the construction of three-way concrete highways and expensive dance halls and hotels. I would keep the units small, but I might make them large enough so that their care could be the responsibility of some disabled veteran whose pension would afford reasonable independence and whose injury might preclude other kinds of activity. This would give him something to do, something that might appeal to him, but I would not extend this privilege to anyone who did not recognize its merit and the motive behind it.

It is possible that such small units of beauty spots as I have suggested could constitute a chain that could be visited by hikers and others out to get some exercise, and interested in knowing their nearby environment better than they did in the past. There might be something of the hostel idea in the picture, although I doubt that I would tie the idea up with any commercial chain.

Before I started any such project, I would make some adequate survey of the interests of representative persons who were in the armed forces. I would seek the cooperation of those most closely associated with men lost in the conflict. I would consult students of local history, and those who best know the local natural history, to the end that the things most truly worth-while would be given adequate consideration. I would enlist the support of owners of desirable areas, particularly if they had suffered losses in the war, and more particularly if they wanted to make a significant contribution to the effort and were not in position to make a generous financial gift.

This morning, as I drove to my office, I picked up a fellow faculty member. As we drove down East Avenue under an arch of glorious elms he remarked that he never got tired of looking down that arch. I reminded him that they were the gift to Cornell of a farmer who, when the university was founded, wanted to do something for the school but could give nothing but a load of elms from his farm. There is nothing more glorious on the Cornell campus than the row of Ostrander elms planted shortly after the Civil War. I doubt if many of the memorials that will be established this year will cause people to thrill to their beauty seventy-five years hence.

These are some of the things that appeal to me as appropriate for a war memorial. I say some, and mean just that, because what my wishes may be should not be identical with the wishes of others. I think that each of us should examine his own conscience and let his findings be his guide. The last thing I would recommend would be that anyone should support an idea such as I have here advanced and try to whoop it up as the only plan worth considering. That would be wholly out of keeping with the sentiment behind it. All I ask is that others consider it for what it is worth and then act accordingly.

Redwood Tribute Grove

A national committee headed by Joseph C. Grew, former United States Ambassador to Japan, has been formed to sponsor the movement for establishment and preservation of an ever-living redwood grove, the National Tribute Grove, in honor of the men and women in our armed services during the war. The great primeval grove of redwoods, comprising more than five thousand acres, is near Crescent City in Del Norte County, California. Contributions are being made to a fund expected to amount to more than a quarter million dollars. The Sierra Club is one group that has made a contribution of one thousand dollars as a tribute to its members in the armed services. The treasurer of the fund is the Save-the-Redwoods League, 250 Administration Building, University of California, Berkeley, California.

Tons and Tons of Food

On the basis of unofficial surveys the National Victory Garden Institute estimates that the Nation's 72,500,000 gardens produced twenty-four million tons of food during the war years of 1942 to 1945, inclusive. Reducing this to dollars and cents, at the conservative figure of seven cents a pound in value, their products were worth $3,360,000.

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BLITZING THE HEMLOCK LOOPER

(Continued from page 36)

The stuff kills on contact and the larvae started falling at once. Mortality was extremely heavy for the first two weeks following application.

Lead arsenate was sprayed on 9306 acres. It was carried in water suspension with a little fish oil added to make it stick to the needles. Results were slower to show since the worms had to eat the poison, but ultimately were fully as satisfactory as the DDT.

The planes made 820 trips to complete the job, and, when flying weather was reasonably good, treated 500 acres a day. This in itself was considered very good, inasmuch as spraying was actually of cubic acres, some of the mix penetrating to the forest floor. Had the chemicals been applied from the ground, the equivalent of an acre's requirement would have been needed to spray one or two trees as effectively, according to experts at the scene.

Total cost of the project was $37,746.63, plus the services of the federal entomologists, and personnel and equipment furnished by the state. The state's share of the cash outlay was $9436.73 and the private operators put up $28,309.90. Entomologist Furniss estimated that had the work been left undone, from 200 to 400 million feet of timber would have been killed in 1945.

The hemlock looper exists unnoticed in the western forest for years, only to break loose in epidemic proportions when conditions are favorable. This was the first outbreak in twelve years. The earliest known looper outbreak was from 1889 to 1891 in the coastal forests of Oregon and Washington. Severe destruction was followed by fires in the bug-killed timber. In 1919-1921 about 500 million feet of hemlock, fir and spruce were killed on some 20,000 acres in northwest Oregon. Part of this looper kill subsequently burned in the great Tillamook fire of 1933. History of such outbreaks is that epidemics usually run a three to four-year course before natural checks, such as parasites, predators, disease and weather, put the insects under control again. Usually there are three years of heavy defoliation. In the present instance, 1945 would have been the second. While the peak might have been reached this year there was every reason to believe that without direct control measures there would have been another heavy defoliation in 1946 and possibly one in 1947.

Like many insects the hemlock loopers have four stages in their life cycle. Moth adults have a wing expanse of about an inch and a half. They begin to appear in September and the bulk of their egg-laying is completed by mid-October. The moths then die. Eggs are small and inconspicuous. They are laid on the underside of tree needles, on twigs, branches and main trunks, especially in moss attached to the tree trunks and branches. They begin hatching in early May.

About mid-June hatching is complete. Young larvae start feeding on salmonberry bushes, huckleberry, salal and even devil's club, then start working their way up and swing into a diet of coniferous foliage. Hemlock is their chief choice but they also consume the greenery of Douglas fir, spruce, and even the pungent western red cedar. Nothing green in the forest is shunned by them except possibly ferns. By the second week in August they usually reach the peak of development. They are then an inch to an inch and a half long, green to brown, nearly hairless. They move along by humping their backs while forelegs are clamped on something solid. Then the rear legs hold while the frontal sets reach out again. The looping motion is what gives the creature its name.

About that time the caterpillars drop to the ground and hole up in bark crevices or underground debris, there to transform into pupae. Ten to fourteen days later the moths appear. The looper spins no cocoon but does produce a silken web by which it drops to the ground. In epidemic areas these webs are so abundant the whole forest looks like a neglected attic.

The company, the state and the bureau are satisfied with results of the control work although they fully realize that further losses may come before Nature puts a heavy foot down on this outbreak. They feel it has not only saved a lot of timber in this instance but has provided experience and information that will be useful against similar outbreaks in the future.

NATURE IN "KENMORE'S" DECORATION

(Continued from page 42)

Yorktown. When Sister Lewis found him he had fallen asleep, muddy boots and all, on top of one of her fine counterpanes.

Colonel Fielding Lewis was a man of wealth when he married the only Washington daughter in 1750, but he was one of those who sacrificed all in the patriot cause. During the Revolution he was Commissioner for the manufacture of small arms in Fredericksburg, and, when the state funds ran out, provided money from his own pocket. At his own expense he fitted out three regiments, and, in addition, presented a ship, the *Dragon*, to the young Virginia Navy.

When he died in 1782 he left a debt of seven thousand pounds, and to meet this his gracious home was sold some time later (1796). For a century and a quarter thereafter the historic house was in strangers' hands. It was about to be sold for building lots in 1922 when patriotic Fredericksburg women, led by Mrs. Vivian Minor Fleming, saved it for the nation.

During World War II the tradition for which "Kenmore" was famous in the long ago has been nobly carried on. Gingerbread, made from the Washington family recipe, has been served with tea to the boys who are shown through the house, and they have been given the freedom of the garden to rest or read or play croquet.

A DOG'S GRATITUDE

By BERTHA P. HILL

Our dog, answering to the name of Pinto—part rabbit hound and several parts mongrel—was devoted to my mother who was blind and ninety years of age. One day, while I was down town, a stranger came to the door to deliver a garment from the cleaners. My mother went to the door with the dog by her side. Any time that she could get her hand on his collar he never made a quick move, but this time, with the inside door open, Pinto was unusually excited and jumping savagely at the screen door, which Mother was holding shut with one hand. In reaching for the dog's collar with the other, she lost her balance and fell backward through another doorway and partly into the next room. Instantly Pinto was all concern for her, licking her hands and face and crying frantically.

The man, seeing that Mother seemed unable to get up by herself, decided he would chance Pinto's turning on him. As soon as he came inside the door Pinto stepped aside and watched him help her up and into her chair. Assured that she was unhurt, the man departed.

The next day I saw the delivery truck on the street and hailed it to express to the driver my appreciation of his kindness. He laughed and said: "The pooch thanked me yesterday. He watched every move I made, sticking close to your mother, and when I turned to leave he reached up and licked my hand."

Java Gardens Safe

Word comes from Java that the famed botanical gardens at Buitenzorg came through the Japanese occupation intact. The collection of plants is in relatively good condition and none of the material was taken away by the Japanese. The extensive library of the Department of Economic Affairs and most of the experimental laboratories were also unmolested. The Buitenzorg gardens were laid out in 1817, and have an international reputation for their numerous contributions to the knowledge of plant life of the tropics.

CELESTIAL EVENTS OF 1946

(Continued from page 46)

Mars on September 24, and with Mercury on October 10.

Saturn starts the year in Gemini, only a few degrees southwest of Mars, but passes into Cancer in July. It will be found there for the remainder of the year. Saturn will be in opposition to the sun on January 12, less than two days before Mars, and may then be seen all night. It will continue to be visible in the evening sky until shortly before its conjunction with the sun on July 21. It then passes to the morning sky, and, a few weeks later, will be visible in the morning twilight. On November 1 it will be on the meridian at sunrise. After its conjunction with Mars on January 22 and March 18 there will be a conjunction with Venus on June 12 and Mercury on June 23. The planet Venus has, in addition to its conjunction with Mars, Jupiter, and Saturn, conjunctions with the planet Mercury on February 14, March 18, and October 31. If the two planets are not too close to the sun at the time this furnishes a convenient way of identifying the elusive little planet Mercury, which is so often lost to view in the twilight.

Uranus, Neptune, and Pluto are generally not referred to in writing about the planets because Neptune and Pluto are always invisible to the naked eye, and Uranus, although visible frequently as a faint star of fifth magnitude, cannot be identified without the aid of a star-atlas. Pluto can be found only with the aid of a powerful telescope.

Wilderness Society

Announcement is made by Benton MacKaye, newly-elected President of the Wilderness Society, of the appointment of Olaus J. Murie as Director and Howard Zahniser as Executive Secretary of that organization. They will take over the duties performed up to the time of his death by Robert Sterling Yard. Dr. Murie will maintain headquarters at Jackson, Wyoming, while Mr. Zahniser will be in charge of the Washington, D. C., headquarters of the Society at 1840 Mintwood Place, N. W. Dr. Murie has been for many years a leading naturalist on the staff of the U. S. Fish and Wildlife Service, and Mr. Zahniser, formerly with that Service, comes to the Society from a position as head of the Division of Information of the U. S. Bureau of Plant Industry, Soils and Agricultural Engineering. He will edit the Society's publication, *The Living Wilderness*, the current issue of which is devoted to the story of the contributions to conservation of the late Mr. Yard.

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THE PADDLEFISH STUMPS THE EXPERTS

(Continued from page 40)

confinement. Ordinarily it is impossible to keep them in aquaria, because of their nervous nature and inability to maneuver in restricted quarters. They usually object to the housecleaning activities required in a well managed aquarium—darting around like mad, slamming themselves and their delicate snouts against the sides of their tank. Walter Chute finally worked out a scheme to have the paddlefish tanks cleaned by hickory shad —fish that served as scavengers. The Chicago Aquarium got its *Polyodon* in 1936 and it is still alive, although this year, 1945, it has not been feeling well. It is no easy matter to provide a *Polyodon* with all the daphnia and other items of its usual planktonic diet. Chute has tried to substitute ground meat for plankton when conditions prevented his men from sailing on Lake Michigan and sifting its waters with their finest mesh nets to gather the tiny items relished by *Polyodon.*

The captive paddlefish will pay no attention to the ground meat unless it is suspended in the water—it never takes food off the bottom. The movements of the school of hickory shad agitate the water and keep the fine particles of meat in suspension, simulating a cloud of plankton organisms. But ground muscle meat does not contain the essential vitamins, oils, minerals and proteins synthesized in plankton under the bright-life-stimulating sun and this may account for the condition of Chute's ailing spoonbill.

The function of the paddlefish's huge nasal adornment has been the subject of much debate. That now famous proboscis is definitely not an offensive weapon like the superficially similar, but really quite different, unyielding, armor-piercing bony sword of *Xiphias gladius,* the swift, torpedo-like swordfish. The paddlefish's bill is stiffish but not rigid, and it may be broken easily. Spoonbills have often been known to pass through the churning turbines of hydroelectric plants. Many emerge in fairly good condition, except for injured beaks. Some fish seem to get along without their nasal staff—others appear to be bewildered and swim aimlessly about.

Some naturalists claim that the paddlefish's paddle is used to stir up the mud and drive the tiny, aquatic, burrowing, insect larvae and other organisms out of their hiding places, so that they may be swept into its huge gaping jaws. Many drawings and paintings of the paddlefish show the fish in the act of stirring the bottom ooze. Some naturalists have gone to the other extreme and have questioned the value of *Polyodon's* elongated snout, saying that it has little, if any, use in straining the microscopic food from the water—a job done by the gill arches.

Dr. C. A. Kofoid, who calls *Polyodon* "a living plankton net," discovered the fact that the fish's paddle-shaped snout is highly sensory and this fact alone furnishes the key to another one of many riddles wrapped in the life of the fish. The paddlefish uses its long, extended snout primarily to detect the presence of its food. When the American Society of Ichthyologists and Herpetologists met in Chicago not long ago, the Shedd Aquarium director put on a special *Polyodon* show for the members. As the visitors crowded about the tank where the paddlefish was lazily cruising about, one of Director Chute's men quietly poured a bucketful of concentrated daphnia into the water. One of the observers of the feeding process was Dr. Charles M. Breder, Curator of Fishes at the American Museum of Natural History, who noticed that just as the cloud of daphnia sank to the level of the spoonbill's paddle, it seemed suddenly to become extremely excited. Its lower jaw dropped like a trap door, opening its huge net-like mouth. With its jaws gaping widely, it cruised about swinging its sensitive snout to the right and left as if seeking to detect and then to engulf the greatest number of daphnia in the tank in the shortest possible time. As another pailful of waterfleas was spilled into the aquarium, the entire performance was repeated.

The snout is only a part of the spoonbill's sensory perceptive organs. It has a strong series of ramifying tubes running from a point near its tiny eyes, along the upper part of its head all the way down to the base of its tail. This device probably is effective in picking up vibrations in the water and accounts for the high degree of nervousness displayed by the fish when its immediate surroundings are disturbed. In addition to this, its enormous opercular flaps that cover the gills and extend far beyond them like an oversized hood, are heavily studded with sensory pits that are arranged in small circular patches. These must serve to enhance its powers of feeling out its environment.

The paddlefish's eyes are not only tiny, but inefficient—it is unlikely that they could bring into clear focus the many microscopic items of its diet. But then *Polyodon* is not interested in single items of its food—it must find swarming colonies and engulf the individuals in countless numbers. In the silt-carrying waters of the Mississippi proper and the murky waters of the bayous, many of the fishes living in these areas are tiny-eyed and almost blind—like the sturgeons and the catfishes. Sturgeon, and catfish rely greatly on their sensitive whisker-like barbels, while *Polyodon* depends upon its tiny sensory organs located in its snout. To the fish, its paddle is like a blindman's stick testing the succession of oncoming events.

It has not yet been determined whether the paddlefish's sensory cells act as tactile receptors or receptors of vibrations set in motion by distant objects. It may have both types. If it can be scientifically established that *Polyodon* actually detects the presence of a colony of microscopic daphnia bobbing in water, or the movement of a tiny mayfly larvae burrowing in the river bottom mud, by picking up their vibrations on its receptor cells, the United States Navy would like to know about it. The Navy has been trying to perfect devices to pick up sounds made under water and to differentiate noises made by peaceful animals like fishes from the warlike noises made by enemy submarines. The Navy may profit by assigning some of their underwater sound experts to the study of the paddlefish system—a system perfected a million years ago.

In 1673, Jacques Marquette and Louis Joliet explored the great "Mississipy" from its northernmost reaches to its mouth. The great Jesuit Father observed and recorded for the first time in the written history of the discovery of America the astonishing scenes, peoples, plants and animals of the new wilderness. His description and his maps inspired and helped to open up the vast new country of the Mississippi Valley to the white man. When Père Marquette arrived at a point below the mouth of the "Mesconsin" (Wisconsin), at about 42° N. lat., he wrote in his journal: "There were scarcely any more woods or mountains. The islands are covered with fine trees, but we could not see any more roebucks, buffaloes, bustards, and swans We came upon, from time to time, monstrous fish, one of which struck our canoe with such violence that I thought that it was a great tree, about to break the canoe to pieces. On another occasion, we saw on the water a monster with the head of a tiger; a sharp nose like that of a wildcat with whiskers and straight, erect ears; the head was gray and the neck quite black; but we saw no more creatures of this sort. When we cast our nets into the water we caught sturgeon, and a very extraordinary kind of fish. It resembles the trout with this difference, that its mouth is larger. Near its nose—which is smaller, as are also the eyes—is a large bone shaped like a woman's corset bone, three fingers wide and a cubit long, at the end of which is a disk as wide as one's hand. This frequently causes it to fall backward when it leaps out of the water." In these words Père Marquette described for the first time our southern sturgeon, the formidable and fearful Mississippi channel-catfish, and the only American paddlefish.

It will not be long now before 300 years shall have elapsed since this discovery. How much longer will the mysteries surrounding the paddlefish continue to stump the experts?

THE "METS" AND MARS

(Continued from page 12)

in and out by means of escape hatches built in the roofs. Snow and wind-driven sleet wore a quarter-inch off boards of the barracks in a single winter.

To fill out other gaps on the world-wide weather map, small "met" detachments carried their own supplies and equipment into the remote regions of China, India and Burma. Additional supplies reached some of these posts only by parachute. Personnel at one remote station were invited to take part in a war between two head-hunting tribes. The men declined, but later, when their would-be hosts passed with thirty bloody trophies, the "mets" radioed for a box of hand grenades, just in case the tribe decided to add some Yankee heads to its collection.

The gods of old China did not object to sharing a temple in the foothills of the Himalayas with an American weather outfit. But this was no stranger quarters than the shell-wrecked wine celler on the Anzio beachhead that sheltered another weather unit during the battle there. Another "met" outfit at Salerno sweated copiously, but not because of the heat, when it found it had been sharing the area with four live German mines.

Mobile units traveled all over Europe. Meteorological teams drove their motorized stations—trucks, vans and jeeps—out of the landing craft and on the beaches while the battles were still raging. Even so, they were not the first weathermen to arrive. Others had jumped with the paratroopers, carrying anemometers and psychrometers instead of tommy guns. These pioneers radioed out weather information that influenced the landing of other men and material.

Once on the ground, the mobile weather units set up for business and issued their forecasts with the assault forces. During the campaign in Normandy, one weather detachment moved seventeen times in thirty days. It covered five hundred and twenty miles and was ready for business within two hours after reaching a new point. Despite heavy artillery fire and air attacks, the outfit took more than two thousand observations and issued more than a hundred and fifty forecasts daily, while the radio operators sent out about a million code words in twenty days.

Weather equipment was as elaborate or as compact as conditions permitted. Europe lent itself to motorized units, while the Pacific islands and vast roadless areas of Asia made such outfits impractical. To meet conditions in these latter places, which were inaccessible even to a jeep, weather stations that could be packed in five boxes were designed. Each box could easily be handled by one man. Such stations, dropped by parachute from an airplane, carried on mule back or by human porters, could be set up in a tent.

The motorized outfits were more elaborate, although these could be streamlined to fit in a jeep. Even the larger, more fully-equipped vans were masterpieces of compactness, and all equipment could be folded and stowed away into the smallest possible spaces.

Hydrogen-filled pilot balloons went up from near front line positions, so close that enemy riflemen could indulge in a little harmless target practice had they been so minded. Some of the outfits, having radiosonde equipment, sent up their balloon-borne radio transmitters to test the temperature and humidity of air masses high above the battle grounds.

Thus, the work of the uniformed meteorologists played an important role in bringing about victory. While most of its activities were cloaked in secrecy for security reasons, the AAF Weather Service spread its wings and its instruments all over the world, so carefully and so thoroughly that scarcely a cloud or a raindrop escaped inspection by the khaki-clad weathermen.

During the war years the "mets" blazed a trail for the skyways of the world. And now that World War II has ended, those trails are ready and waiting to be expanded and bettered by peacetime trade and travel.

UNCLE SAM'S BIRD

(Continued from page 18)

motionless, unblinking majesty upon the highest limb of the tallest tree in all the countryside, keeping guard over mate and nest, over wood and water. Or you may first have seen him taking a power dive from the skies, uttering his war cry as he stoops to pounce upon the shapes that stir beneath the waters. Or perhaps you have watched, as I have, a flock of eagles soaring, circling, rising up around one another until they become specks against the blue. Then it is not the dark spread of wings that vanishes last, but the flash of the proud crest, like the twinkle of snow on distant mountains.

Hunters and Fires

Two California deer hunters found carelessness expensive recently when they were found guilty of building campfires in a dangerous place, during windy weather, and without confining them. Each was fined $500, but the U. S. Forest Service estimates that this carelessness cost the taxpayers $65,000, and caused damage of $250,000 to National Forest land and privately-owned timber. The hunters shot a buck and, in their haste to pack out the meat before dark, left their fire still smoldering. A high wind did the rest.

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Under the Microscope

By JULIAN D. CORRINGTON

RESINOUS MOUNTING MEDIA

INSTRUCTIONS for mounting slide preparations of every variety so generally specify balsam as the medium that the inexperienced microscopist is apt to overlook the fact that this natural resin is only one of a great many preparations available for the purpose. Our aim this month is to introduce many of our readers to other mountants, in the hope that they will try out at least several of those here described.

When the term balsam is employed without qualifications, the reagent indicated is Canada balsam, a turpentine derived from *Abies balsamea*, the balsam fir of Canada and the northern United States. The resin secured from this tree is clear, light yellow, viscous, and aromatic; liquid at first but gradually hardening to a transparent solid on exposure to air, because of evaporation of the lighter ingredients. Supply house catalogs list natural balsam, the material as collected except that it is filtered through paper and rendered neutral chemically, and xylol balsam, with the resin dissolved in xylene, the preferred form for most uses. Microscopists commonly keep this mountant in a special form of glassware, the balsam bottle, a squat jar difficult to overturn, and provided with a cap and applicator rod.

While Canada balsam is a universal favorite, this does not mean that it is the most perfect mountant for every purpose. Balsam has become a custom—even a tradition—and it is easier to have a single mounting medium at hand, to apply without giving thought to the matter, than to maintain half-a-dozen from which to choose. All mountants thicken with exposure, and are then thinned by adding some of their solvent. The task of keeping several kinds constantly at the proper consistency for immediate use is an added burden. However, this medium has a number of disadvantages that should not be overlooked. In addition to thickening, balsam slowly darkens in color with age unless protected from light; old balsam is quite a dark amber. Old slides show this effect also. When used in ringing slides or for uncovered mounts, as a Golgi preparation, this resin cracks badly. Collectors of the natural substance frequently adulterate genuine Canada balsam with the turpentines of spruces, even pines, through ignorance, or intent to defraud with a cheaper substitute, and deliver a product that is variable and uncertain in content and performance.

A practical difficulty with balsam is its slowness in drying. Slides must be kept flat and used with great caution, if at all, for a week, or weeks, or even months after mounting before they are thoroughly hardened. Large or heavy objects, as foram shells or starfish eggs, will drift to an edge of the cover glass, even after a year or more, unless the slide is kept flat at all times. Perhaps the most serious defect of balsam, however, is that stained sections mounted in this medium frequently fade, sometimes in a short period of time. The fading starts at the edges and works inward. It has generally been held that the balsam is acid, or becomes so, but Bensley states that this is incorrect; that, on the contrary, there is a tendency for some component of balsam to absorb oxygen, and so reduce the dyes. If this is true, then the practice of many microscopists of keeping one or two small pieces of marble in the bottom of their balsam bottle, to assure the medium remaining neutral, is irrational.

Older technique manuals specify a number of alternative resins. Dammar, colophonium, camsal, sandarac, oil of turpentine, and others that have been preferred from time to time by certain technicians or for special purposes, have all largely disappeared from use today.

Drawn by Jordan Sklar, a student of Dr. B. R. Weimer at Bethany College, Bethany, West Virginia

Dammar (also spelled damar), gum dammar or dammar balsam, as it is variously called, is a natural resin from a wide variety of East Indian trees, and is hence not a uniform product. It may be purchased as a solution in xylene, or in lump form. Bensley dissolves the lumps in petroleum ether (caution: highly inflammable!) in a tightly-stoppered flask so that it can be inverted daily to insure mixing. After two weeks, the solution is filtered, placed in a wide vessel with a gauze covering to permit evaporation of the ether, then redissolved in xylene to the preferred consistency. Johansen melts the lumps over a hot flame and pours the melted dammar into the solvent, filters through coarse filter paper in a ridged funnel, then filters again through fine paper if the first filtrate shows any cloudiness due to dust or specks of debris. The solvent may be xylene or, for faster drying, benzene.

A few advanced workers in this country prefer dammar to balsam in that it will not produce fading in stained sections. Lee states, however, that all dammar mounts become granulated in time, varying from a few weeks to months, or, sometimes, years. He cites a splendid collection of slides, prepared by an expert, nearly all of which were ruined by granulation when examined after the death of their maker. On the whole, Canada balsam seems to be greatly preferred to dammar balsam, but the newer synthetic resins bid fair to replace both of these natural products within a few years.

Another old favorite still has its uses, especially in the preparation of whole mounts of delicate materials, notably filamentous algae, as *Spirogyra*. This is Venetian turpentine, the technique for which is advanced and tricky, requiring considerable experience for successful manipulation. Hyrax, Styrax, and a few others that have a high index of refraction, are far superior for whole mounts of diatom shells and are virtually limited to that field of interest.

Among the first of newer products to challenge the balsams for a place on the mounter's table was Euparal, a mixture of the natural resins camsal (itself a mixture of camphor and salol), sandarac, eucalyptol, and paraldehyde, manufactured by Flatters and Garnett, in England. The American equivalent is Diaphane. Such trade names as these are capitalized when first mentioned here, but not thereafter, the present custom being to degrade terms of this sort to common nouns.

Euparal or diaphane possess the great advantage of clearing tissue and completing dehydration without the necessity of going through either absolute alcohol or xylene. Slides are mounted directly from 95% alcohol. The work should be done quickly to prevent clouding of the medium, but should this occur a gentle warming of the slide will dispel the cloudiness. Blood films stained with Wright's are superior for study if

mounted in these media. Euparal vert and diaphane green contain a copper salt which intensifies hematoxylin stains and are widely used with such preparations. Delicate materials that would be injured by absolute alcohol or xylene are best mounted in one of these mixtures.

Trichlorethylene is a new solvent for the balsams that overcomes the slow-drying objection. The newest mountants are, however, synthetic resins. The composition of a manufactured reagent can be rigidly controlled and standardized, eliminating the hazard of ingredients of unknown nature, proportions, or behavior. Results with synthetic mountants can be predicted with certainty. One of the first of these on the market was the Synthetic Neutral Resin of Flatters and Garnet, another is Permount, put out by the Fisher Scientific Company, and a third is Clarite, made by the Neville Company. These are stated to be permanently water-white, neutral, will not crystallize or granulate, will not cause fading of dyes, and dry very quickly. We have used all three of these for some time and have had uniform success with them; to date all slides made with them remain colorless and have not faded or otherwise changed. As far as we can observe at present there is nothing against any of them and no criteria by which to choose one over the others; all three are equally excellent.

These resins are commonly made up as solutions of either toluene or xylene; some workers prefer one solvent, some the other. Toluene solutions dry more rapidly than those in xylene, some technicians think, too rapidly. Clarite may be secured as a lump resin if preferred, when it is made up as a 60% solution; 60% resin and 40% xylene, toluene, benzene, or dioxan, the latter preferred for the dioxan technique. A second Neville product is termed Clarite X, which is somewhat cheaper, yellows slightly but not as much as the natural balsams, and has a higher refractive index.

Isobutyl methacrylate is a duPont preparation that gives a water-white mountant hardening in five to ten minutes. O'Brien and Hance suggested that this reagent can take the place of both mountant and cover glass: if a stained and cleared section is dipped into a thin solution of this substance and withdrawn with care so that the liquid drains off evenly from the slide, the thin film remaining will harden rapidly and form an excellent protection for the material. It can be polished with a paper handkerchief and can be written on with ordinary ink, doing away with the paper label. Or, a label may be prepared in the ordinary manner and pasted to the slide, then coated with methacrylate, thus giving the label a transparent protective coating. The back of the slide may be left with a film of the solution, or may be cleaned with a cloth moistened in benzene or xylene, the solvents for this resin.

A more technical point, not heretofore discussed, concerns the refractive index of these media, a very important consideration for many cases. Reduced to simplest terms, refraction is the bending of a ray of light when passing obliquely from a medium of one density into another medium of a different density, as when a ray passes from water into air, or from a piece of tissue into balsam. Refractive index (R.I.) compares the *amount* of bending in any given substance with that in a vacuum, arbitrarily designated as 1. Since all materials are denser than a vacuum, all R.I.'s are greater than 1.

The figure given for any transparent material indicates the relative bending power of the medium on light rays. Manufacturers use these indices in selecting suitable glass for making lenses, and the microscopist chooses his mountant by the same principle. The rule is that the nearer the R. I. of the medium to that of the object, the less the contrast between object and mountant, and the greater the transparency. This closeness of R.I. may be desirable in some cases, but if the indices should be identical, the object would become invisible. Conversely, the farther the R.I. of the medium from that of the object, preferably higher than lower, the greater the contrast and less the transparency.

Diatoms furnish a good example. Their shells (valves) are composed of silica (R.I. 1.434), the tiny plants actually dwelling in "glass houses." When mounted on a glass slide (R.I. 1.52) in balsam (R.I. 1.526) transparency is perfect but the finer markings on the shells cannot be seen; there is no contrast with the background. Consequently hyrax (R.I. 1.7 to 1.8) is greatly preferred for diatom work, the higher index of refraction providing the necessary contrast and bringing out the minute striations clearly.

Indices are determined by an instrument termed a refractometer, and vary according to purity of the product. Thus a synthetic resin, made by a chemical formula, will have a definite, invariable index, as 1.544 for clarite, while natural resins, with variable ingredients and possibly impurities, may range over several figures, as hyrax, with an R.I. from 1.71 to 1.822 for different samples. This is another decided advantage in favor of the newer mountants. Indices also vary with the wave length of the light used in their examination; figures quoted are for the D line of the spectrum.

A few of the more important refractive indices affecting microscopy are: Acetone—1.364, Alcohol, ethyl absolute—1.367, isopropyl—1.378, methyl—1.323, tertiary butyl—1.388, Anilin—1.586, Canada balsam, solid—1.535, in xlene—1.526, Cellosolve—1.406, Clarite—1.544, Clarite X—1.567, Colophonium—1.545, Dammar

TECHNICAL BOOKS for GIFT PURPOSES

The microscope is the hand-maiden to all the sciences and those who follow its adventuresome trail must have many a guide to direct them along the right path.

One item that is wholly indispensable is books! Any of the following, depending on the individual's inclinations, will make an acceptable and valued Christmas gift.

Fresh-water Algae of the United States, by G. M. Smith	$ 6.00
Fundamentals of Bacteriology, by M. Frobisher	$ 4.00
General Bacteriology, by D. B. Swingler	$ 3.00
Textbook of Botany, by Transeau-Sampson-Tiffany	$ 4.00
Finger Prints, Palms and Soles, by Cummins & Midlo	$ 4.00
Fundamentals of Comparative Embryology of the Vertebrates, by Alfred F. Huettner	$ 4.50
Developmental Anatomy, by Leslie B. Arey	$ 6.75
A Text-Book of Histology, by J. Lewis Bremer	$ 6.50
Handbook of Microscopic Characteristics of Tissues and Organs, by Karl A. Stiles	$ 1.50
The Microscope, by S. H. Gage	$ 4.00
The Microscope, by R. M. Allen	$ 3.00
Working with the Microscope, by J. D. Corrington	$ 3.50
Adventures with the Microscope, by J. D. Corrington	$ 5.00
Animal Micrology, by M. F. Guyer	$ 2.50
The Microtomist's Vade-Mecum, by A. B. Lee	$ 9.00
Textbook of Mycology, by E. A. Bessey	$ 4.00
The Advance of the Fungi, by E. C. Large	$ 4.00
Parasitology, by Hegner, Root, Augustine, and Huff	$ 7.00
Clinical Parasitology, by Craig and Faust	$ 9.00
Photomicrography, by R. M. Allen	$ 5.50
Protozoology, by R. R. Kudo	$ 6.50
Biology of the Protozoa, by G. N. Calkins	$ 7.50
Optics and Service Instruments, anonymous	$ 1.75
Introduction to Physiology Optics, by J. P. C. Southall	$ 5.50
Textiles and the Microscope, by E. R. Schwarz	$ 4.00
Textile Fibers; Their Physical, Microscopical and Chemical Properties, by J. M. Matthews	$10.00
College Zoology, by R. W. Hegner	$ 3.75
Animals Without Backbones, by R. Buchsbaum	$ 5.00
Man and the Vertebrates, by A. S. Romer	$ 4.75

If you send your order at once, we will do our best to have the books shipped so as to arrive on or before Christmas Day. ACT AT ONCE.

AMERICAN NATURE ASSOCIATION
1214 Sixteenth St., N. W.
Washington 6, D. C.

balsam—1.52, Diaphane—1.483, Dioxan—1.423, Euparal—1.483, Fluorite—1.433, Glass, crown—1.49-1.55, barium crown—1.54-1.66, fluor crown—1.46-1.51, flint—1.54-1.96, barium flint—1.53-1.67, borate flint—1.53-62, Glycerin, 50%—1.397, concentrated—1.473, Hyrax—17.1-1.822, Isobutyl methacrylate—1.477, Methyl salicylate—1.53, Oil of bergamot—1.464, of cedar, thickened—1.52, of cinnamon—1.619, of cloves—1.533, of thyme—1.483-1.51, of turpentine—1.474, of wintergreen, synthetic—1.53, Paraffin, liquid—1.471, Piperine (for diatoms)—1.657-1.68, Quartz—1.46-1.55, Realgar (for diatoms)—2.14-2.549 (highest known), Sandarac camphloral—1.485, Styrax (for diatoms)—1.582-1.63, Synthetic neutral mountant, F & G—1.515; Terpineol—1.484, Toluene—1.495, Trichlorethylene—1.478, Water, distilled—1.336, sea water—1.343, Xylene—1.497.

Suggestions for sources of supply:

E. I. duPont de Nemours & Co., Inc., Wilmington, Del., isobutyl methacrylate.

Eimer & Amend, 205-223 Third Ave., New York, permount.

Fisher Scientific Co., 711-723 Forbes St., Pittsburgh, permount.

Flatters & Garnett, Ltd., 309, Oxford Road, Manchester, 13, England, euparal, synthetic neutral mountant.

General Biological Supply House, Inc., 761-763 E. 69th Pl., Chicago 37, many of the newer reagents in small quantities; clarite, diaphane.

Hartman-Leddon Co., 6010 Haverford Ave., Philadelphia 31, clarite, colophonium, trichlorethylene, venetian turpentine.

The Neville Co., Neville Island, Pittsburgh, clarite.

Arthur H. Thomas Co., West Washington Square, Philadelphia, euparal.

Will Corporation, Rochester, N. Y., diaphane.

All supply houses carry Canada balsam and dammar.

TRADE NOTES

Human Biology In their advertisement of Millard & King's *Human Anatomy and Physiology*, the Publishers state: "This textbook represents, we believe, one of the most significant contributions to the teaching of elementary anatomy and physiology in print today," a description that we can endorse with enthusiasm. The second edition of this successful work, first issued in 1941, has now appeared and incorporates complete rewriting and expansion of the chapter on the automatic nervous system, and revision of such sections as those on physiology of muscle, circulation, blood pressure, arterial pulse, nerve impulse, cranial nerves, and others. There are 44 new illustrations, 14 in color.

We were much impressed with the first issue of this fine text and can only repeat our recommendation: a skilfully organized and well written book, the chapters beginning with outlines and ending with summaries and discussion questions; the coverage brief, yet thorough; the illustrations, particularly the originals by Lucille Cassell, outstanding. For nurses, biology students, and the layman who wishes an interesting and readable book on this most important of subjects, we know of no better choice. Pp. viii, 514; figs. 297, 43 in color. The W. B. Saunders Co., West Washington Square, Phila. 5, 1945. $3.00.

General Biology In presenting a course in general biology which is actually biology and not a hodgepodge of zoology and botany, the writing of a text is far easier than of a laboratory manual. Most teachers and authors have abandoned the attempt or have frankly preferred lecturing on biology but offering one semester of botany and one of zoology in the laboratory; clearly not a satisfactory solution of the problem. Chief difficulty lies in the fact that if the student jumps from an isolated observation or experiment on a plant or a small part of a plant to another study on an animal, then back and forth in order to grasp such fundamentals as respiration or cell differentiation, he probably derives no conception, or a very incomplete and distorted one, of the organization of either kingdom, or of any living plants or animals.

The well-known horns of the dilemma have been very satisfactorily polled, in our opinion, by Professors Weimer (zoologist and biologist) and Core (botanist) of Bethany College and West Virginia University respectively, in *A New Manual for the Biology Laboratory*. Here are some of the points that make us feel this to be the best such publication appearing to date: the written material is gathered together in the first 49 pages, thoroughly organized, outlined, with sections numbered and set off by distinctive type faces; in this short space there are 671 numbered topics, hence it is evident that the authors are not verbose and do not interlard laboratory instruction with matter that properly belongs in a textbook; somewhat more than half this material is devoted to general biology (e.g., food manufacture, digestion, food transfer, homology and analogy, ecology) and the remainder to a taxonomic survey of both kingdoms, wherein the student learns both principles and types; the topics call for drawings, ask questions to be answered in a written report, make comparisons, specify experiments, of which there is a large number, and otherwise stimulate and guide the student, using the scientific method as a guide.

The remaining pages are perforated for removal and punched for a ring binder, and contain completed drawings for labeling, outlines for completion and labeling, or blank spaces to be occupied by specified drawings. The last is excellent as it avoids use by the student of other, non-uniform paper, and makes for a compact, neat workbook. There are 155 such drawings in all. Every teacher of general biology at the college level should inspect this excellent manual. Pp. vii, 213; many illustrations. John Wiley & Sons, Inc., 440 Fourth Ave., N. Y., 16, 1944. $2.00.

APPLE POLISHER

Among the numberless time-consuming tasks that fall to the lot of the teacher in biology or chemistry is that of maintaining the stock bottles of various solutions and reagents. If you do not happen to know of the following simple procedure, you will find it an effective addition to your bag of tricks.

As an example, assume a given instructor has a one-gallon, narrow-mouthed, glass-stoppered bottle in which is kept 5% formalin for use in microscopy, preserving dissection specimens, or refilling specimen jars. The demands on this container are frequent and the continual measurement of ingredients to refill it are laborious and a waste of time. Measure out 100 cc. full strength commercial formalin and pour into this stock bottle when next it has been emptied. The dilution wanted for a 5% solution is 20 parts of water to 1 of formalin, so next measure and add 2,000 cc. tap water. Type or print a blank adhesive label reading as follows: 5% FORMALIN. To refill use 100 cc. 100% formalin, add water to top of this label.

Moisten the label and affix it to the bottle carefully so that the top line of the label coincides with the level of liquid in the bottle. Thereafter only the formalin needs measuring; the repeated filling of several graduate cylinders with water is avoided. The same idea can be applied to many other cases. For a 70% alcohol, ascertain the quantity of 95% alcohol and of distilled water needed to nearly fill the stock bottle, then use two labels, the first stating: fill with 95% alcohol to top of this label. The second label, placed above the first, will then read: add distilled water to top of this label. For normal saline (0.6% sodium chloride in distilled water) the label would read: fill with distilled water to top of this label, add 12 g. NaCl.

A.S.A.M.

May we take this bit of space to call to the attention of any new readers the American Society of Amateur Microscopists, founded in 1939 and now boasting a membership of more than one thousand. Information about the Society, its activities and publications may be obtained from the secretary, Herman W. Fowler of the Bell Telephone Company, Pittsburgh. His address is 2729 Connecticut Avenue, Pittsburgh 16, Pennsylvania.